"U.S. NEEDS PLANES AND MEN"—GENERAL ARNOLD

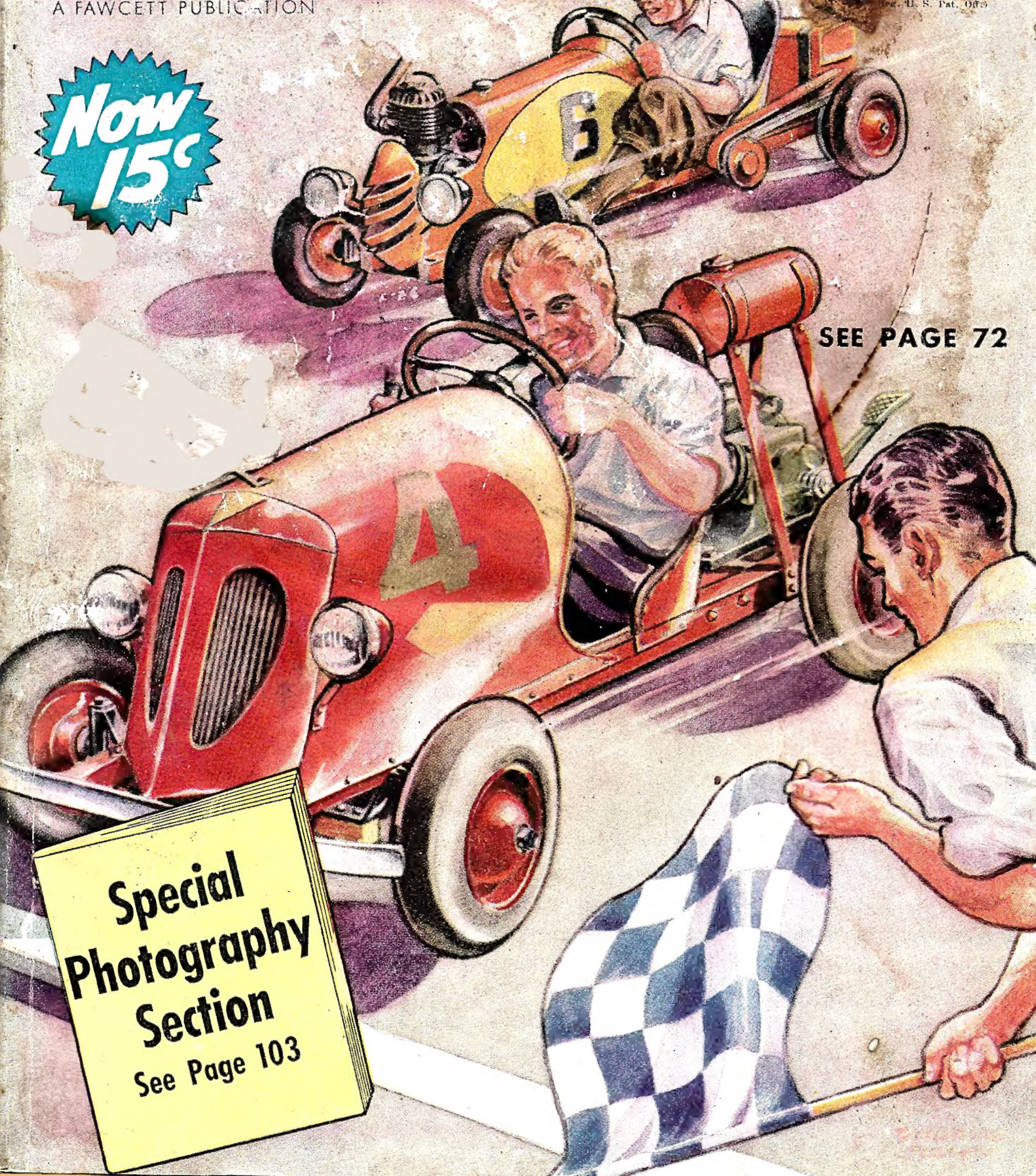
MAY
NSC

MODERN MECHANIX

A FAWCETT PUBLICATION

Reg. U. S. Pat. Off.

Now 15¢



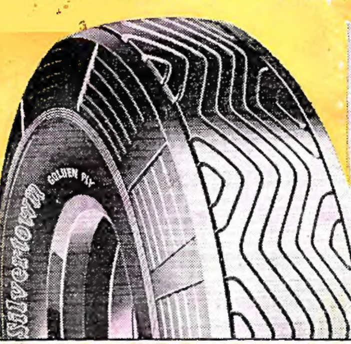
SEE PAGE 72

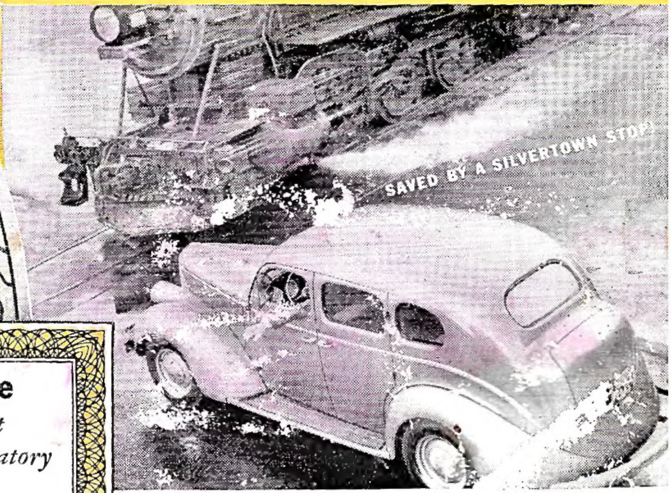
Special Photography Section
See Page 103

MAY 1938
MODERN MECHANIX HOBBIES AND INVENTIONS
15 CENTS

NEW KIND OF TIRE

GIVES THE *QUICKEST* NON-SKID STOPS YOU'VE EVER SEEN!





Here's the Evidence

from America's Largest Independent Testing Laboratory

"BOTH regular, and also the premium-priced tires of America's six largest tire manufacturers were submitted to a series of exhaustive road tests made over a three months' period by us, to determine their resistance to skidding and wear, with the following results:

"NON-SKID—The new Goodrich Silvertown with the Life-Saver Tread gave greater skid resistance than any other tire tested, including those tires listed at from 40% to 70% higher in price.

"MILEAGE—The Goodrich Silvertown gave more non-skid mileage than any of the other tires tested in its own price range—averaged 19.1% more miles before the tires wore smooth.

"BLOW-OUT PROTECTION—Despite the severe nature of these tests, no Silvertown blew out, or failed from any cause, while two tires of other makes failed."

A. R. Ellis, Pres.

PITTSBURGH TESTING LABORATORY

Wins Hands Down in Competitive Road Tests by Famous Testing Laboratory

AGAIN Goodrich makes tire history! With a new Goodrich Silvertown that is really *two* great tires in one! For *inside* the tire is Golden Ply protection against high-speed blow-outs. And *outside* is the new Life-Saver Tread that, in exhaustive road tests by the impartial Pittsburgh Testing Laboratory, gave "greater skid resistance than any other tire tested."

This tread is actually a *road dryer!* Its never-ending spiral bars, acting like a battery of windshield wipers, sweep water from under the tire, force it out through the *deep* drainage grooves—make a *dry track* for the rubber to grip.

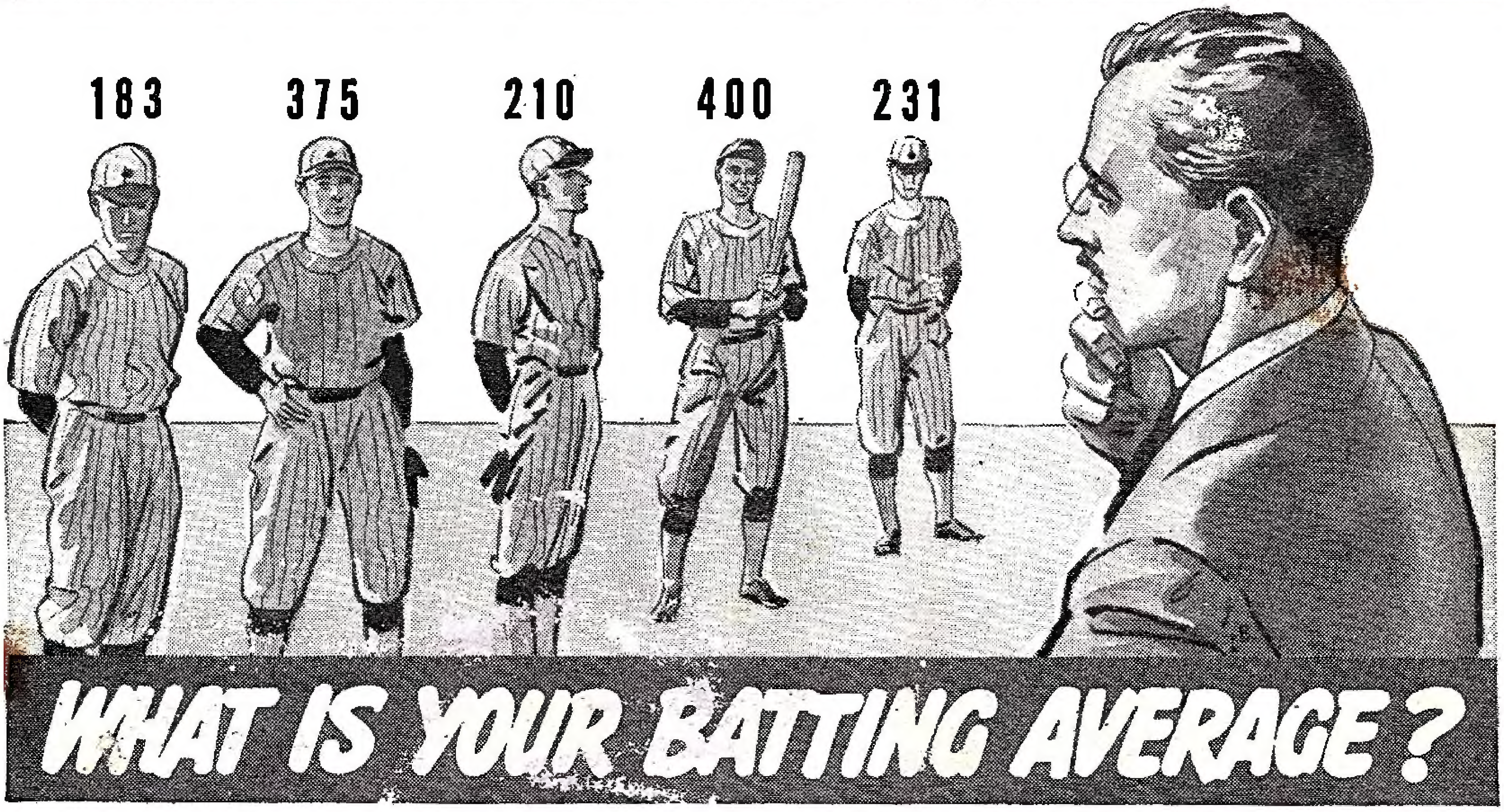
No Extra Cost!

Go to your Goodrich dealer or Goodrich Silvertown Store for a *free* demonstration. Remember, this new skid-protected Goodrich Silvertown also has the famous Golden Ply protection against blow-outs. So you get *two* great life-saving features—AT NO EXTRA COST!—to say nothing of 19.1% greater non-skid tire mileage—which means you get EVERY 6TH MILE FREE!

The new Goodrich SAFETY Silvertown

SKID PROTECTION OF LIFE-SAVER TREAD ◆ GOLDEN PLY BLOW-OUT PROTECTION

IF THE BOSS IS A BASEBALL FAN—


183
375
210
400
231
WHAT IS YOUR BATTING AVERAGE?

In baseball, either you hit the ball or you don't—the record speaks for itself! Whether you ever realized it or not, the same is true on any job—the record speaks for itself! And the way you hit the ball on your job, and the measure by which your boss compares you with other men, is—most likely—training. The home runs go to those who know how to hit them. Many of the job home-run hitters today got their starts by spare-time study of International Correspondence Schools Courses. This coupon is your invitation to follow in their footsteps. Why not mark the subject that interests you most—and mail the coupon today? It may be a big step in your life!

INTERNATIONAL CORRESPONDENCE SCHOOLS

BOX 2318-Q, SCRANTON, PENNA.

★ Without cost or obligation, please send me a copy of your booklet, "Who Wins and Why," and full particulars about the subject *before* which I have marked X: ★

TECHNICAL AND INDUSTRIAL COURSES

- ☐ Architect
- ☐ Architectural Draftsman
- ☐ Building Estimating
- ☐ Contractor and Builder
- ☐ Structural Draftsman
- ☐ Structural Engineer
- ☐ Management of Inventions
- ☐ Electrical Engineer
- ☐ Electric Lighting
- ☐ Welding, Electric and Gas
- ☐ Reading Shop Blueprints
- ☐ Heat Treatment of Metals
- ☐ Sheet-Metal Worker
- ☐ Boilermaker
- ☐ Telegraph Engineer
- ☐ Telephone Work ☐ Radio
- ☐ Mechanical Engineering
- ☐ Mechanical Draftsman
- ☐ Machinist ☐ Toolmaker
- ☐ Patternmaker
- ☐ Diesel Engines
- ☐ Aviation Engines
- ☐ Automobile Mechanic
- ☐ Commercial Refrigeration
- ☐ Plumbing ☐ Steam Fitting
- ☐ Heating ☐ Ventilation
- ☐ Air Conditioning and Cooling
- ☐ Steam Engineer
- ☐ Steam Electric Engineer
- ☐ Marine Engineer
- ☐ R. R. Locomotives
- ☐ R. R. Section Foreman
- ☐ Air Brakes ☐ R. R. Signalmen
- ☐ Highway Engineering
- ☐ Civil Engineering
- ☐ Surveying and Mapping
- ☐ Bridge Engineer
- ☐ Bridge and Building Foreman
- ☐ Chemistry
- ☐ Pharmacy
- ☐ Coal Mining
- ☐ Mine Foreman ☐ Fire Bosses
- ☐ Navigation
- ☐ Cotton Manufacturing
- ☐ Woolen Manufacturing
- ☐ Agriculture
- ☐ Fruit Growing
- ☐ Poultry Farming

BUSINESS TRAINING COURSES

- ☐ Business Management
- ☐ Industrial Management
- ☐ Traffic Management
- ☐ Accountancy
- ☐ Cost Accountant
- ☐ C. P. Accountant
- ☐ Bookkeeping
- ☐ Secretarial Work
- ☐ Spanish
- ☐ French
- ☐ Salesmanship
- ☐ Advertising
- ☐ Service Station Salesmanship
- ☐ First Year College Subjects
- ☐ Business Correspondence
- ☐ Stenography and Typing
- ☐ Civil Service ☐ Mail Carrier
- ☐ Railway Mail Clerk
- ☐ Grade School Subjects
- ☐ High School Subjects
- ☐ College Preparatory
- ☐ Illustrating
- ☐ Cartooning
- ☐ Lettering Show Cards ☐ Signs

DOMESTIC SCIENCE COURSES

- ☐ Home Dressmaking
- ☐ Professional Dressmaking and Designing
- ☐ Advanced Dressmaking
- ☐ Millinery
- ☐ Tea Room and Cafeteria Management, Catering
- ☐ Foods and Cookery

Name..*Age*..............*Address*..

City..*State*..............................*Present Position*..

If you reside in Canada, send this coupon to the International Correspondence Schools Canadian, Limited, Montreal, Canada

PRICE
15 CENTS

SAME PRICE
IN CANADA

MODERN MECHANIX

MAY
1938

Volume XX
Number 1

Circulation over 250,000

Copyright 1938 by Fawcett Publications, Inc.

SPECIAL FEATURES

Your Newspaper By Radio! - - - - - - 35

New York World's Fair Takes Shape - - - 38

U. S. Needs Planes And Men - - - - - - 42

By Brigadier General H. H. Arnold,
Assistant Chief of the Air Corps, U. S. Army

The Biggest Little Show On Earth - - - - 48

By Robert M. Hyatt

The Men Behind The Stop Watch - - - - 58

By Maxwell Reid Grant

Tuning Up The Outboard Motor - - - - 68

Pursuing The Postmark - - - - - - - 70

By Montgomery Mulford

How To Cut Sections For Your Microscope - 84

By Julian D. Corrington, Ph.D.

(Continued on page 8)

Next Month—

A BIG SURPRISE!

When you go to the newsstand next month you will find a bigger, better magazine bearing a new title—MECHANIX ILLUSTRATED. This will be your old friend MODERN MECHANIX in new, modernized dress, with color-photography cover.

MECHANIX ILLUSTRATED will contain more pages, more and bigger pictures, more human-interest feature articles, more home-workshop and hobby projects, more and bigger plans and drawings.

Pass the good news on to your friends and tell your newsdealer to reserve a copy for you. The price remains 15 cents—the biggest bargain on the market!

The new MECHANIX ILLUSTRATED will be out May 10.

LOOK FOR

MECHANIX ILLUSTRATED
FORMERLY MODERN MECHANIX
15¢

Published monthly by Fawcett Publications, Inc., 11th St., & Broadway, Louisville, Ky., U. S. A. Business office, 22 West Putnam Ave., Greenwich, Conn. Entered as second-class matter under the Act of March 3, 1879, at the post office in Louisville, Ky., with additional entry at Greenwich, Conn. Editorial offices: 1501 Broadway, New York, N. Y. Not responsible for unsolicited manuscripts. In U. S. and Possessions and in Canada, 15c a copy; $1.50 a year. Send subscriptions to Greenwich, Conn., address. Other Postal Unions, $2.00 a year. East Indian Agent, P. C. Eranee Sons, Bombay, India. Printed in U. S. A. Advertising forms close the first of second month preceding date of issue. Advertising offices: New York, 1501 Broadway; Chicago, 360 N. Michigan Ave.; San Francisco, Simpson-Reilly, 1014 Russ Bldg.; Los Angeles, Simpson-Reilly, Garfield Bldg. Member Audit Bureau of Circulation.

W. H. FAWCETT, Publisher RALPH DAIGH, Managing Editor ROBERT HERTZBERG, Editor AL ALLARD, Art Director
JOHN L. SCHERER, CLIFFORD PETERS, Associate Editors S. S. RABL, Naval Consultant

How Big Is YOUR PAY-CHECK?

If you earn under $3,000, Higher Accountancy *may be the answer for you*

ACCOUNTANCY
The Profession that Pays

"THE size of my pay-check? What business is it of yours?" Perhaps that's the first reply that comes to your mind.

But—stop a moment. It really *is* our business—to help men just like you. In fact, it's been our business here at LaSalle for 30 years.

If your pay-check isn't all that you'd like it to be, why not consider accountancy? Why not become a member of this well-paid and respected field? Why not, in short, prepare yourself to earn real money—insure a good home for your family—a new car—an education for the growing youngsters—a bank account for a rainy day . . . these and many more of the precious things in life?

Maybe you're one of those ever hoping for "breaks" that will give you a higher standard of living. Yet that's precisely what most of 30,000,000 other employees in this country are doing.

Not all of them, of course. Here and there you find ambitious men who aren't depending on luck to carry them ahead. They're following a tested path to increased earnings—leaving nothing to mere chance. They're *training* themselves for better jobs—every week spending a few hours in serious but interesting study at home.

Some day, as expert bookkeepers and later as accountants, these determined men will have standing and a considerably larger income—in a profession that pays and pays well.

Why don't *you* do as they are doing—take advantage of LaSalle training? Even though you do not know the fundamentals of bookkeeping now—you nevertheless have an excellent opportunity to master accountancy. Many others have done it!

Perhaps you're asking yourself, "But don't these others possess natural ability that I lack? Don't I need a special talent for all this?"

Ask rather, "If I do my part, won't *I* get results, too?"

You will! For all it takes is intelligence, serious study and work—not genius. Under the LaSalle system you solve problems by simple steps . . . from day to day, as an expert accountant does. You use the same basic principles. And when these problems become difficult and puzzle you, you get counsel that could be matched only through personal coaching by a battery of experts in a big accounting house.

In a comparatively short time, you train yourself in Elements of Accounting, Principles of Accounting, Auditing, Cost Accounting, Business Law, Organization, Management and Finance. The training—complete and intensive all the way—takes you right into C.P.A. coaching if you desire.

Later, when you're an accountant, it may be possible to go into business for yourself as a public accountant and be independent. Or, if you choose to work for someone else as an executive accountant, it well may be for a salary several times that which you draw now.

Write for this FREE book

If you're tired of pinching pennies, investigate accountancy and LaSalle training. There isn't a faster, less expensive or more convenient method to master accountancy. Fill in the coupon and mail. We'll send you our 64-page book, "Accountancy, The Profession That Pays."

Then, when you read all the facts, you yourself will be able to judge best whether you have the will to study and apply your best efforts—toward a more secure future.

LASALLE EXTENSION

Adult Business Training Dept. 5493-HR Chicago, Ill.

I want to earn a bigger salary—through accountancy training. Send me, without cost or obligation, your 64-page book, "Accountancy, The Profession That Pays."

Name . . . .

Present Position . . . . Age . . . .

Address . . . . City . . . .

A frank man to PATENTS-INVENTIONS

THE world of invention moves on. About a hundred years ago people were saying, "There's nothing left to invent"—today we know that is one of the funniest things ever said. Just think what has happened in the last hundred years! Autos, radios, airplanes, and thousands of useful, practical devices for home, shop and office have been invented and put on the market. Inventors are constantly making the world a better place to live in. Did you see a notice in the paper that an obscure worker, Hans Wach, has invented a simple device to utilize exhaust steam on steam boats. *Already, the report states, the steam ship lines have saved more than $15,000 in fuel bills with his invention.* Almost in the same breath the Dept. of Commerce announces that it will soon test out a new non-crashable aeroplane, which the average man can learn to fly in a day, which will travel at 110 miles an hour and sell at the price of a cheap automobile. An unknown Seattle man has invented a robot to go 5,000 feet under the sea and recover millions and millions of dollars worth of gold lying at the bottom of the ocean since the days of the early Spaniards.

Remember this: For every outstanding big invention there are thousands of small, simple things for use in the home, the office, the factory, on the farm, on every sort of travel conveyance. Little articles like you find on the counters of a 10-cent store, hardware store, drug store, toy and novelty shop.

Many Little Ideas Have Big Commercial Possibilities

A person finds something he's using doesn't work right, or it's clumsy, or costs too much. He gets a happy thought. He improves the old Article. That's contribution to human progress. That's the way that many, many men have reached the goal of financial comfort, independence and even wealth. Most of the things millions of us use didn't come from the brains of engineers and physicists. They came from the mind and maybe the crude home work bench of Mr. Average Man, busily engaged in earning his bread and butter at whatever chance or circumstance has given him to do. The "little" man's opportunity as an inventor was never greater than it is today.

Who Are Inventors?

You'd be amazed at the men we contact in the course of a busy year. Most of them do not consider themselves inventors at all. During their work or leisure they get an idea. They work it out on paper. They get in touch with us about Protection. Did you know that a dentist invented the stock ticker, a school teacher the telephone, a farmer the typewriter, an artist the telegraph? Did you know that the crinkly hair pin—sold by millions now—came about because a husband saw his wife twisting the old-fashioned straight hair pin to make it stay in place? Poor men who have no thought of invention now will be financially well-fixed in a few years because of a happy thought that the world could use to advantage.

Can You Answer These Questions?

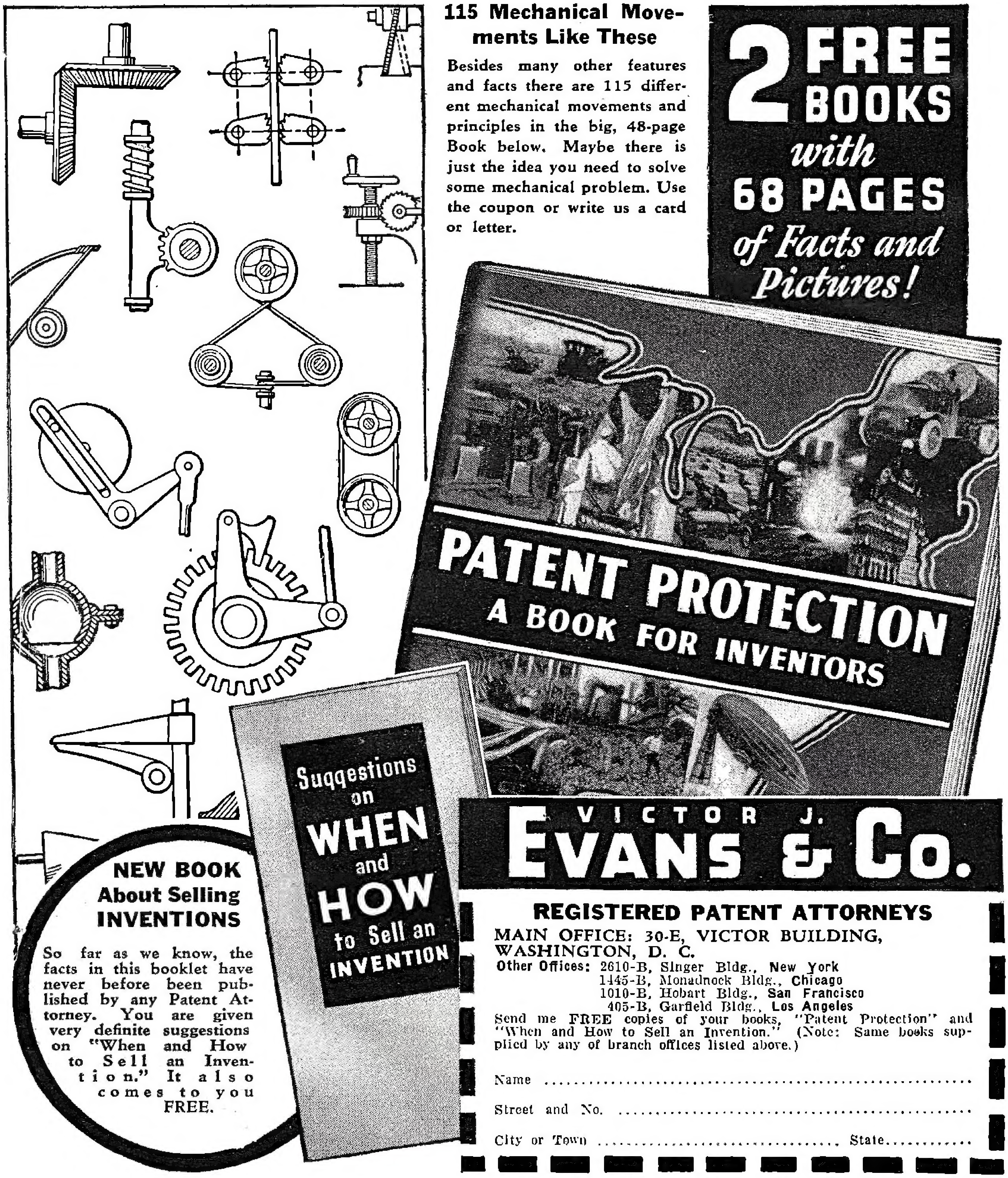
Ask yourself these questions: How do the Patent Laws protect me? What easy steps can I take, without cost, to put myself in position to support my belief that I am the *first* man to think of *my invention?* Is a Patent worth the cost? Do I need a model? Should I try to sell my invention before I have it Patented? Is there any safe, business-like way to secure financial help? If I do apply for a Patent how shall I reach people who can market my invention? Can I protect and sell an improvement on some invention that has already been patented? These are but a few of the questions which usually confront the average man. You need the answers! YOU CAN HAVE THEM, without cost, trouble, or delay.

Our Business Is To Help You. Write Us Today

For more than forty years, this firm has been helping men with an inventive turn of mind. We maintain a large staff of trained, experienced specialists—Registered Patent Attorneys, Draftsmen, and Searchers to help our clients secure all the protection to which they are entitled. Fees are reasonable. Deferred payments frequently arranged. Questions promptly answered. Write us frankly with absolute assurance that what you say will be treated with strictest secrecy. But FIRST, send for the FREE BOOKS shown on the opposite page. They are filled with facts, pictures and suggestions. They tell you things about Patents, Inventions and Selling Inventions that we have learned in our long experience. They may save you time, expense, EVEN LATER DISAPPOINTMENT. Simply fill in the coupon. No charge, no obligation. Write us today.

RUSH COUPON TO WASHINGTON, D.C. TODAY

man talk about -SELLING INVENTIONS



115 Mechanical Movements Like These

Besides many other features and facts there are 115 different mechanical movements and principles in the big, 48-page Book below. Maybe there is just the idea you need to solve some mechanical problem. Use the coupon or write us a card or letter.

2 FREE BOOKS *with* 68 PAGES *of Facts and Pictures!*

PATENT PROTECTION
A BOOK FOR INVENTORS

Suggestions on WHEN and HOW to Sell an INVENTION

NEW BOOK About Selling INVENTIONS

So far as we know, the facts in this booklet have never before been published by any Patent Attorney. You are given very definite suggestions on "When and How to Sell an Invention." It also comes to you FREE.

VICTOR J. EVANS & CO.

REGISTERED PATENT ATTORNEYS

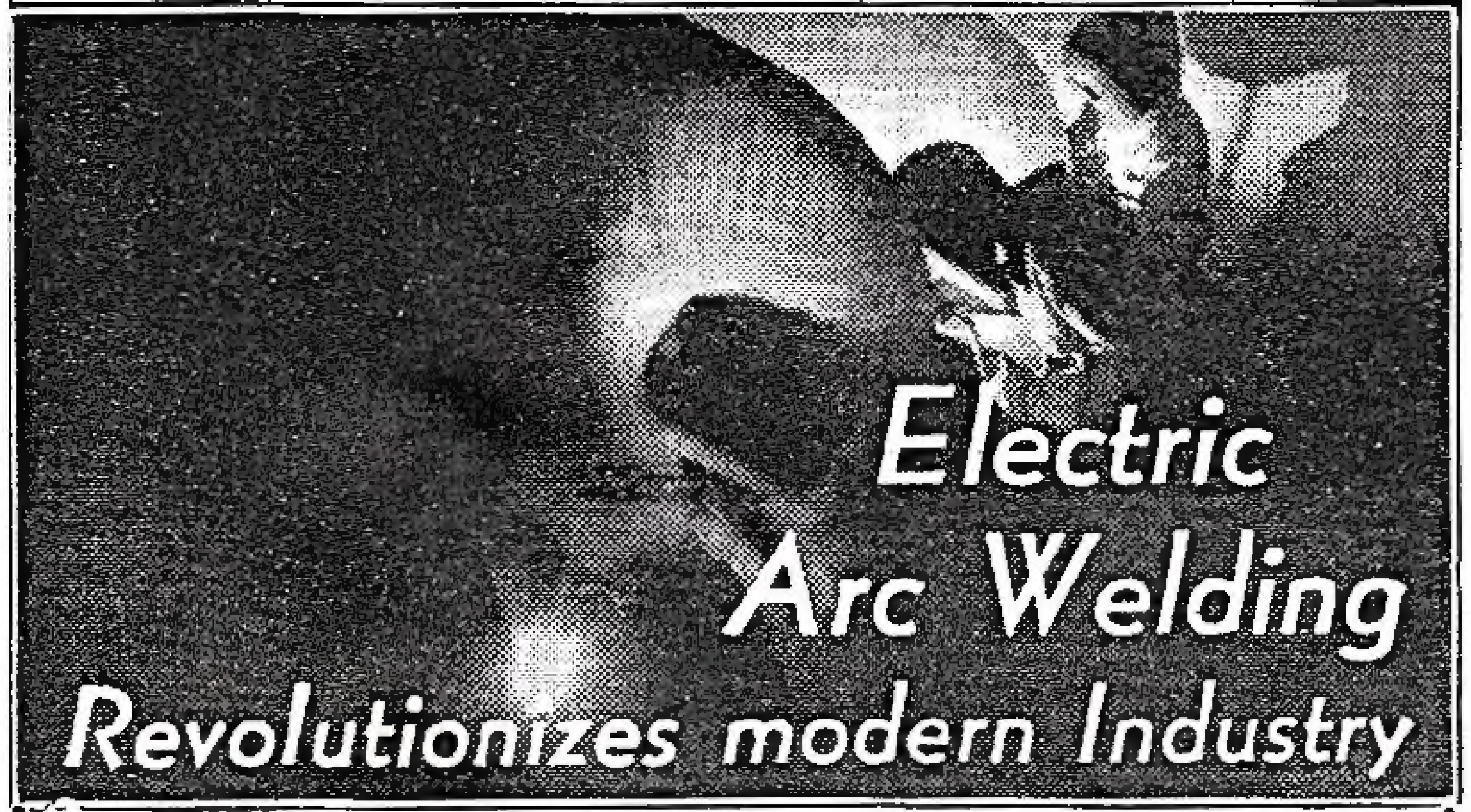
MAIN OFFICE: 30-E, VICTOR BUILDING,
WASHINGTON, D. C.
Other Offices: 2610-B, Singer Bldg., New York
1445-B, Monadnock Bldg., Chicago
1010-B, Hobart Bldg., San Francisco
405-B, Garfield Bldg., Los Angeles

Send me FREE copies of your books, "Patent Protection" and "When and How to Sell an Invention." (Note: Same books supplied by any of branch offices listed above.)

Name ....

Street and No. ....

City or Town .... State............



U. S. Manufacturers desire men to learn Electric Arc Welding and get practical experience under actual production conditions in the laboratories of the School of Engineering. Moderate training Fee. Accepted applicants will be fully trained until ready to pass rigid test and assisted in securing employment.

ARC WELDING presents one of the outstanding opportunities for steady income and future success. Welding is growing rapidly, replacing large and intricate castings, rivets, nuts, bolts, screws. It is commonly used in assembling cranes, hoists, bridges, structural steel work, etc. No limit to the application of welding to industry, increasing durability and reducing manufacturing costs. There is a decided shortage of properly trained Welding Operators, Technicians and Welding Engineers. Why be content with ordinary work, hit and miss jobs and low pay when in a short time you can become a trained Specialist in Welding?

MILWAUKEE
SCHOOL of ENGINEERING
Institute of Electrotechnics

538-MM North Broadway and E. State, Milwaukee, Wis.

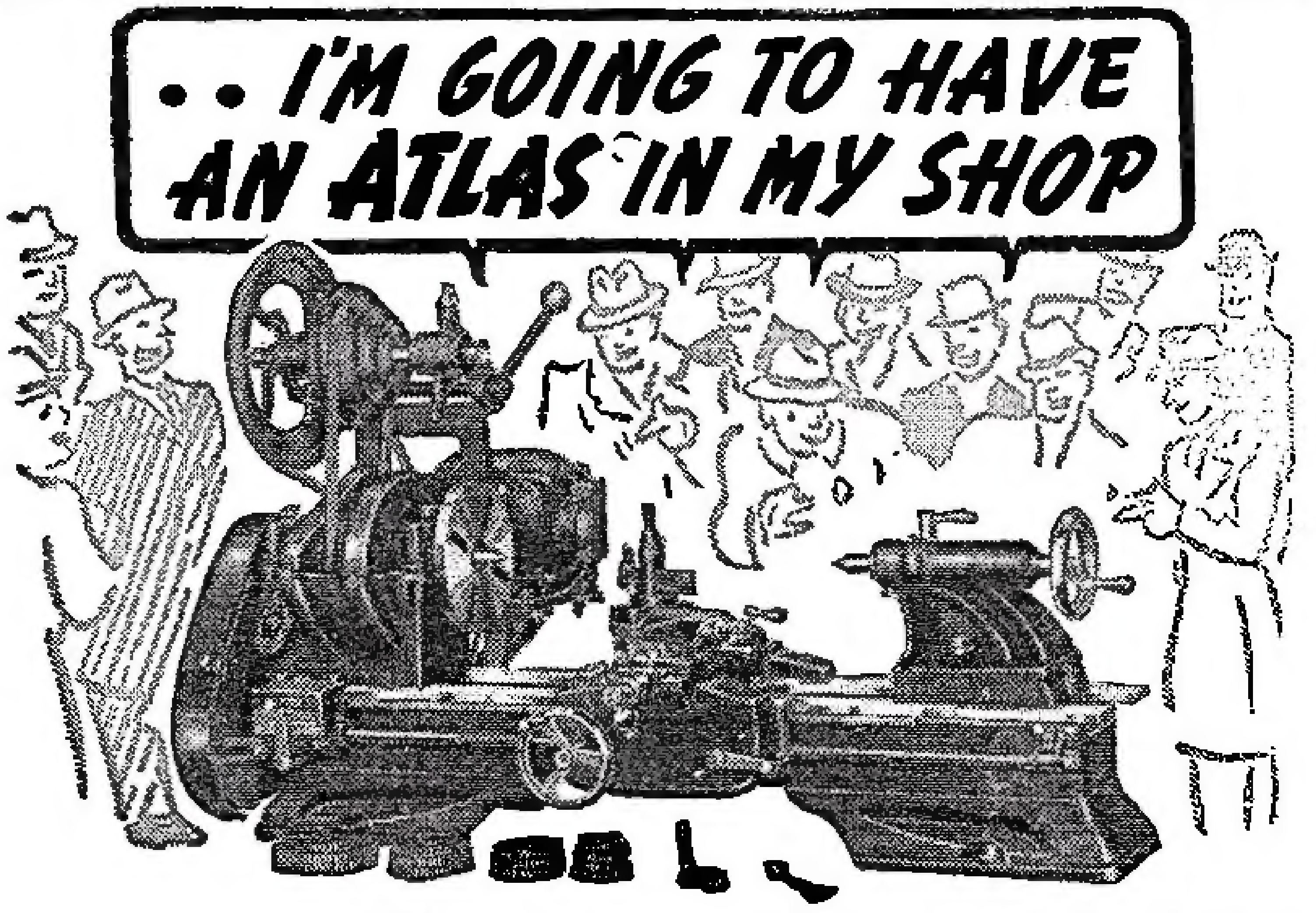
Without obligation send Free Booklet "The Dawn of a Gigantic Industry and its Outstanding Opportunities."
Also tell me how to become a

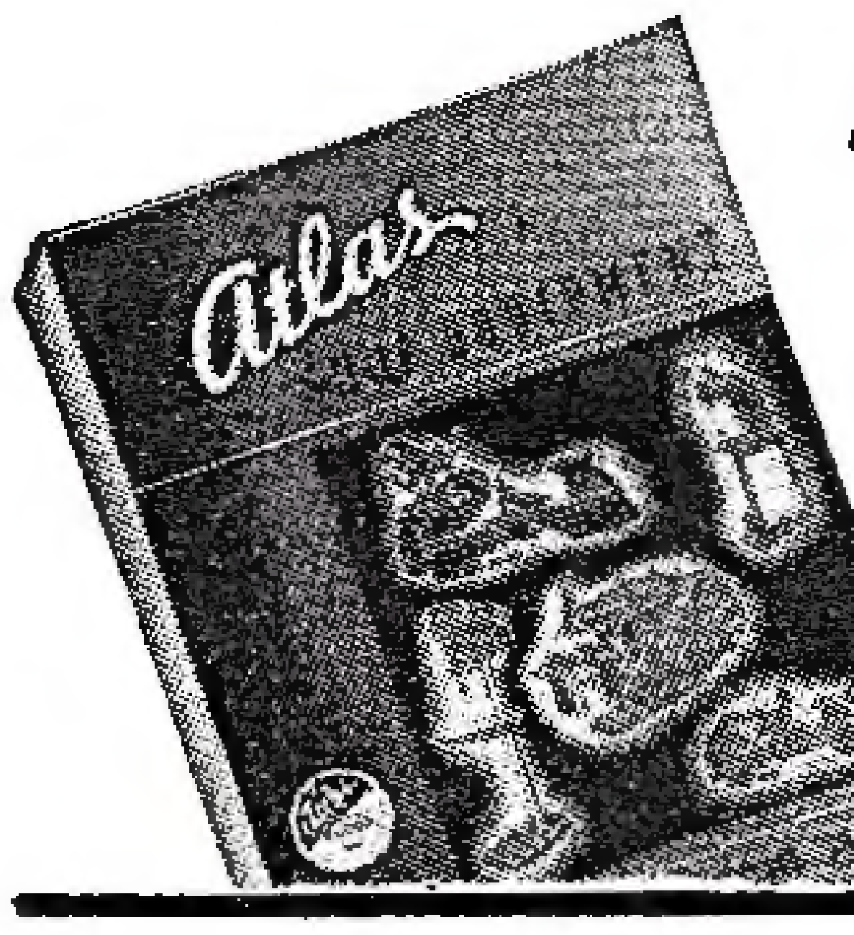
Welding Operator (3 mo.)____	Refrigeration and Air Conditioning Technician (3 mo.)_____
Gas Welder (6 wks.)________	Air Cond. Engr. (1 yr.)________
Welding Technician (6 mo.)__	Radio, Television (6 mo.)_____
Welding Engineer (1 yr.)____	Commercial Radio Engineer (1 yr.)
Electrical Engineer B. S. Degree (4 yrs.)_______	
Student Loan Plan_________	Earn Part Expense Plan_______

Name________________________________Age___________

City_____________________________State______________

MAKE MONEY IN YOUR WORKSHOP
Build furniture, auto trailers, canoes, iceboats, cruisers, sailboats and electric refrigerators described in
FREE BLUEPRINT BOOKLET
MODERN MECHANIX PUBL. CO., Fawcett Bldg., Greenwich, Conn.


..I'M GOING TO HAVE AN ATLAS IN MY SHOP



Free NEW CATALOG

All who see the Atlas precision lathes and other shop equipment talk about the power, versatility, and extra features of these modern machine tools. See for yourself before you buy. Send for new 1938 Catalog today.

ATLAS PRESS CO.
552 N. Pitcher Street
Kalamazoo, Mich.

CONTENTS—Continued from page 4

SHORTER FEATURES

Modelers Display Craft - - - - - - - - 54
Behind The Scenes At A Museum - - - 64

MODERN PHOTOGRAPHY SECTION

Winners Of Photo Awards - - - - - - - 103
The "Tin Can Special" Enlarger - - - - - 104
Filter Facts and Factors - - - - - - - 107
Kinks For Camera Fans - - - - - - - 110
Portable Safelight - - - - - - - - - - 112
Developer Heaters - - - - - - - - - - 112
Novel Mirror Picture Frame - - - - - - 113
Glassless Negative Holder - - - - - - - 113
Developing Outfit For Cut Film - - - - 114
Amateur Photo Puzzlers - - - - - - - - 116

HOW-TO-BUILD FEATURES

A Wrought Iron Globe Light - - - - - 71
This Sidewalk Runabout Is Easy To Build - 72
Test Your Model Airplanes In This Wind Tunnel - - - - - - - - - - - - 76
Build A Jiffy-Skiff - - - - - - - - - 80
A Model Airplane Jig Saw - - - - - - 81
Construct A Small Gate Leg Table - - - 82
A Home-Made Drag Saw - - - - - - 87
Cigarette Box Has Trick Lid - - - - - 91
A Utility Table For The Auto - - - - - 98

FOR THE WORKSHOP FAN

Handy Wire Brush Wringer Fits Any Paint Can - - - - - - - - - - - - - - 78
Handy Kinks For Star Drills - - - - - 78
Handy Sandpaper Files - - - - - - - - 79
Choose The Right Brush - - - - - - - 94

RADIO AND ELECTRICITY

Device Shows Bus Location - - - - - 57
New Ultra-Violet Ray Source - - - - - 65
How To Reduce Hum In Radio Receivers - 100
Shielded Lead-In Gives Reduction In Noise Level - - - - - - - - - - - - - 100
A Fused Line Filter - - - - - - - - - 101
Meter Tests Reading Light - - - - - - - 102

AUTOMOTIVE

Auto Courtesy Light Devised - - - - - 62
Hand Meter Tests Headlights - - - - - 67
Short Cuts For The Motorist - - - - - 99

AVIATION

Model Plane To Serve As Target For Artillerymen - - - - - - - - - - - - 52
Aero Experts Praise Diesels - - - - - 62
Constructs Novel Altimeter - - - - - 66

[*Continued on page* 10]

Animals To Supply Heat In Air-Conditioned Barn

AIR-CONDITIONING, coupled in America's mind with big cities, big theaters and luxurious private homes, can be expected to invade the farm shortly to make the farmer's barn a better place to work in and a more healthful place for livestock to live in.

But when it does invade agriculture, air-conditioning will not always use the apparatus utilized in the cities. This was indicated in an article by F. L. Fairbanks in the current issue of Agricultural Engineering.

A mechanical heating unit or a mechanical cooling unit is not always strictly necessary to air-condition a barn where livestock are kept, Mr. Fairbanks reveals. Animal heat, good insulation and proper ventilation are frequently the only ingredients necessary to control the atmosphere in which farmers must work and livestock must live. Some of the equipment can be made from materials found on any farm.

Air-conditioning for barns and storage cellars and buildings are discussed by the agricultural engineer. The problem of storage conditioning is made relatively simple by the fact that no air flow is needed. In fact, he remarks, except for the occasions on which the storage space should be aired, any air flow is actually undesirable. A large amount of the heat required in winter can come from the bodies of the animals themselves, provided the insulation is effective enough to retain that heat within the building, Mr. Fairbanks explains.

A trough near an opening in the roof can be used to take advantage of the relative flow of hot and cold masses of air to circulate clean air through the building. Back of the scheme described by Mr. Fairbanks is the fact that winds come from the same relative motion of hot and cold masses of gas in the earth's atmosphere.

Defective Welds Detected By "Magnetic Eye"

A "magnetic eye" which can see into metals and detect bad welds has been developed by Professor W. B. Kouwenhoven of Johns Hopkins University and A. E. Vivell of Princeton University.

The "eye" is based on principles of magnetism. The welded seam is magnetized by a powerful alternating magnetomotive force. For welds less than one-quarter-inch thick, 60 cycle current insures penetration of the magnetic flux. Two search coils connected in opposition are placed on the seam so that any stray field which may be present cuts their windings. The shape of the wave of electromotive force induced in the coils is then observed by means of an oscillograph.

Get a Real Kick Out of Life!
GEE! NOTHIN' TO DO. I'M SICK OF SITTIN' AROUND HOME
C'MON BILL, I'LL SHOW YOU HOW TO HAVE FUN!
THIS IS THE LIFE! FUN AND THRILLS EVERY MINUTE!

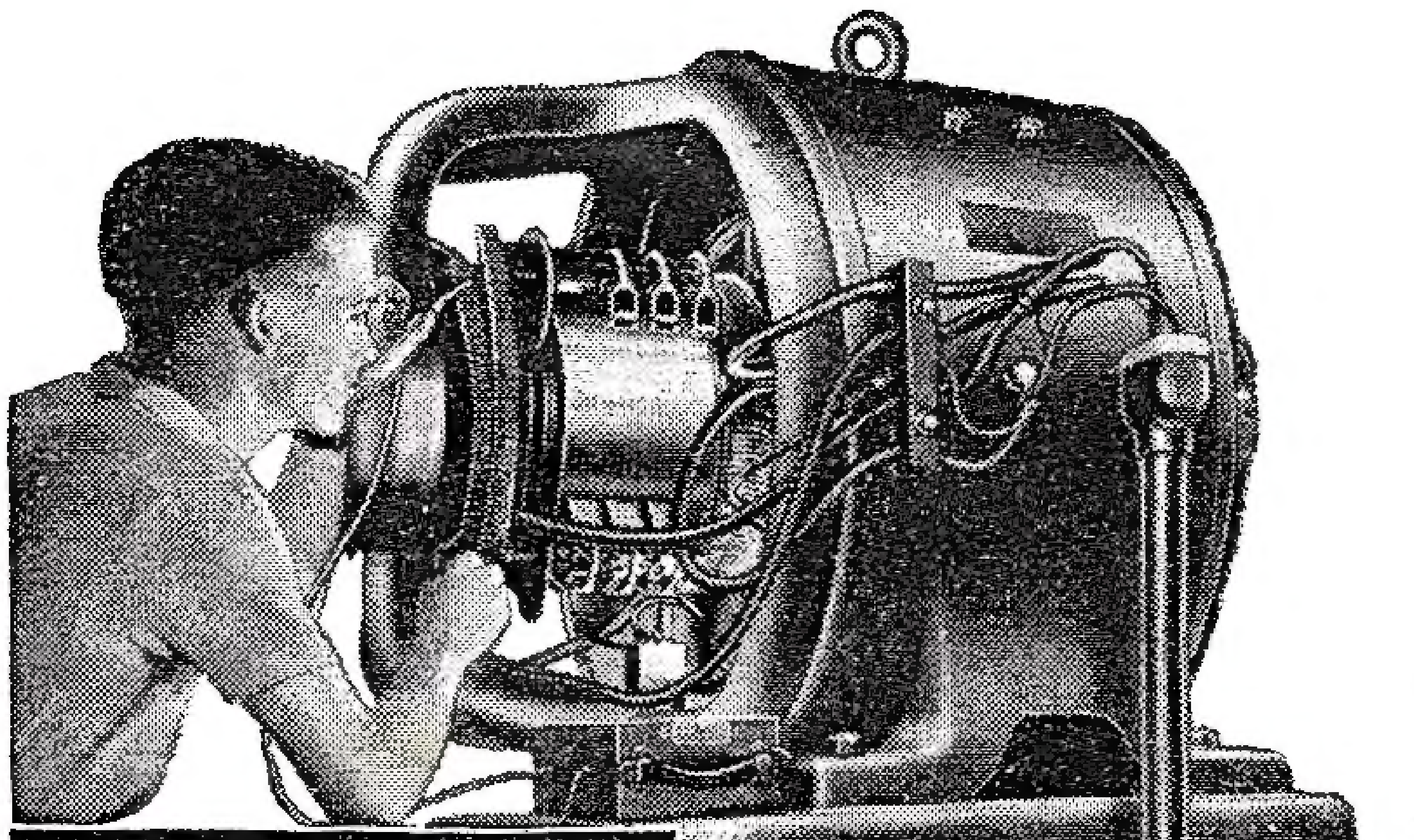
Motorcycling is the world's greatest outdoor sport! Good times all the time for the owner of a Harley-Davidson. Ride with the happy members of your local motorcycle club. Go on gypsy tours, reliability runs, tourist trophy races; take in hillclimbs, race meets and other thrilling events. See the classy 1938 models at your Harley-Davidson dealer. Ask about his Easy Pay Plans—mail coupon NOW!

Harley-Davidson

KING OF THE HIGHWAYS

HARLEY-DAVIDSON MOTOR CO.
Dept. MM-538, Milwaukee, Wis.
I'm rarin' to be a rider. Send FREE motorcycling magazine, "The Enthusiast" and illustrated literature. Stamp is enclosed to cover postage.

Name______________________________Address__________________
City_______________________________State____________________
My age is ( ) 16-19 years, ( ) 20-30 years, ( ) 31 years and up, ( ) under 16 years. Check your age group.



TRAIN FOR A GOOD PAY JOB IN ELECTRICITY ON REAL MOTORS, GENERATORS, ETC.

PAY TUITION AFTER GRADUATION

Practical training on full size electrical equipment. **"Learn by Doing" in 12 short weeks.** No previous experience or advanced education needed. Send the Coupon NOW for Big Free Illustrated Book.

Learn about the "Pay Tuition After Graduation Plan," "Part Time Employment Plan." "Job After Graduation Service." NOW . . . Diesel, Air Conditioning and Electric Refrigeration at no extra cost.

MAIL THIS COUPON TODAY

H. C. LEWIS, President; COYNE ELECTRICAL SCHOOL
500 S. Paulina St. Dept. 58-53 **Chicago, Ill.**

Please send me your Big Free Book and details of your "Pay Tuition After Graduation Plan."

NAME...

STREET...

CITY..............................STATE...........

Learn Profitable Profession in 90 days at Home

Salaries of Men and Women in the fascinating profession of Swedish Massage run as high as $40 to $70 per week but many prefer to open their own offices. Large incomes from Doctors, hospitals, sanitariums and private patients come to those who qualify through our training. Reducing alone offers rich rewards for specialists. Write for Anatomy Charts, and booklet—They're FREE.

THE College of Swedish Massage
1601 Warren Blvd., Dept 558, Chicago
(Successor to National College of Massage)

NOW YOU CAN GET A HEAVY DUTY INDUSTRIAL WELDER

WORKS ON 110-VOLT Electric Light CIRCUIT

for Only **$19.75** RETAIL

At this unheard of price, you can get this marvelous DYNAMIC Super-Charged Welder—this welder is a radical departure from accepted welding practices. It will do the work of much higher priced types—efficiently cooled—light of weight—easily portable. Will solder and braze on the lightest material. Works on iron, steel, tin, brass, copper and all other metals.

WELDS Cylinder Blocks, Bumpers, Fenders, Tanks, Farm Machinery...

AGENTS Make big profits selling to garages, factories, janitors and machine shops. Write TODAY and ask for our 10-DAY TRIAL OFFER.

With this Dynamic Super-Charged WELDER, a man without previous experience can make as much as $5.00 on a repair job that can be done in less than one hour. Many welding operators make as much as $15.00 - $20.00 a day—Go into business—Open a Welding Shop NOW.

DYNAMIC WELDER COMPANY
2226-DF Silverton Road, Chicago, Illinois

CONTENTS—Continued from page 8

NEW MECHANICAL INVENTIONS

Test Chair Gauges Comfort - - - - - - 41
Wrist Magnet Is Beauty Aid - - - - - - 41
Sun Operates Gas Machine - - - - - - - 47
Machine Tests Peas' Quality - - - - - - 52
Simplified Deep-Well Pump Increases Efficiency 50% - - - - - - - - - - - 53
Apparatus Breaks Germs With Tonal Waves 55
Ice-Making Unit Mounted On Trailer-Type Truck - - - - - - - - - - - - - - 56
New Tool Exerts Pressures Up To 1,500,000 Pounds - - - - - - - - - - - - - 57
"Phonograph" Tests Mentality - - - - - 63
Gasoline Turbine Engine Perfected For Marine Use - - - - - - - - - - - - 65
Apparatus Takes Photographs Of Invisible Particles - - - - - - - - - - - - - 66
Scale Device Tests Peaches - - - - - - - 66

DEPARTMENTS

Problems - - - - - - - - - - - - - 18
Chips From The Editor's Workbench - - - 28
Nic Sprank's Oddities - - - - - - - - 34
Crafts And Hobbies - - - - - - - - - 71
Photography Section - - - - - - - - - 103
New Ideas For Home And Shop - - - - 146

OUTDOOR KINKS

Hints For The Fisherman - - - - - - 88
Tips For The Home Gardener - - - - - 92

MISCELLANEOUS

False Gems Easily Detected - - - - - 41
Process Reinforces Oil Films - - - - - 41
Mirror Teaches Batting - - - - - - - 47
Hospital Boasts Safety Chute - - - - - 47
Tiny Tea Set Worth $2,000 - - - - - - 52
Night View Of Edison Tower Makes Striking Photograph - - - - - - - - - - - 53
Tiny Stage Coach Model Valued At $1,500 - 55
Fooling The Birds - - - - - - - - - - 56
Lock Raises Vessel 60 Feet - - - - - - 57
Scientist Secures Photo Of Large Sunspot Group - - - - - - - - - - - - - - 62
Working Steam Roller Model Pulls Heavy Load - - - - - - - - - - - - - - 63
Engineers Pave River Bed - - - - - - 65
Student Develops Explosive - - - - - 67
Miniature Home Features 35 Furnished Rooms - - - - - - - - - - - - - 67

Enjoy a Real Job in Industry

STRUCTURAL AND CIVIL
ELECTRICAL
ARCHITECTURAL
DIESEL-AUTOMOTIVE DRAFTING
MECHANICAL

Become a Draftsman

Steady Work

As nearly all manufacturing and building starts on the drafting table, the draftsman is one of the first to be hired, last to be laid off. His blueprints, his specifications, give the final word in what the workmen are to do.

Good Pay

The draftsman has been called the Junior Engineer, which accurately describes his work, position and pay. He combines knowledge of principles, mechanism and construction details with ability to draw plans and indicate methods. Usually his salary is considerably above the wages of the mechanic and, of course, less than that of the engineer.

Chance for Promotion

Helping design new buildings, machines or construction methods, the draftsman knows what his firm is planning or considering. It may be the superintendent—engineer—even the prospective buyer with whom he consults. These contacts, plus his experience, place him in an excellent position for promotion when next there is a good opening.

Young at 40

Athletes, farmers, factory and shop workers — all who rely on muscle often are old at 40. Office workers — executives, teachers, professional men, *draftsmen*—just approach their prime at 40 to 50. Training increases your value AT ONCE and *continues* to help boost your earning power as you mature.

Don't Be Just Average

What happens to the average man? Not having thorough training for a worth-while job, he goes along year after year, wishing he had a good job, but wishing was never a substitute for training. $40 a week is about his top, usually never that high. Grows old on the job, starts down at 40, finds himself slipping in speed and salary.

Security for Yourself and Family

Even if you are now only 18, 25 or 30, you should *look ahead* —begin training TODAY for the job you want at 50. Training helps you to be independent—self-supporting. It helps you to enjoy associations denied to untrained men. Training helps you to offer your family advantages far in excess of what you could give them as an untrained man. Investigate NOW.

American School, Dept. DD 528, Drexel at 58th, Chicago

Make Money In Your Workshop — Free Blueprint Booklet

More than 125 plans are listed in the new MM Blueprint Booklet for building your own radio, boats, model railway, electric refrigerator, model planes and scores of other projects. Send stamped-addressed envelope for free copy.

Modern Mechanix Publishing Co. **Fawcett Bldg., Greenwich, Conn.**

ARREST HIM, OFFICER!

I'LL HAVE COMPLETE FACTS ON THE OTHER FELLOW TONIGHT!

OPERATOR NUMBER 38

Secret Service Operator No. 38 is on the job . . . FOLLOW HIM through all the excitement of his chase after the counterfeit gang. Write NOW for

FREE Confidential Reports No. 38 Made to His Chief !

It may open your eyes to the great opportunity for YOU as a well paid Finger Print Expert. The kind of work you'd like. Excitement! Travel! Thrills! A REGULAR MONTHLY salary, REWARD MONEY. Graduates of this school HEAD 47% of all Identification Bureaus in U. S.! Write for Free Reports, Finger Print Book, low prices. Easy Terms Offer, if 17 or over.

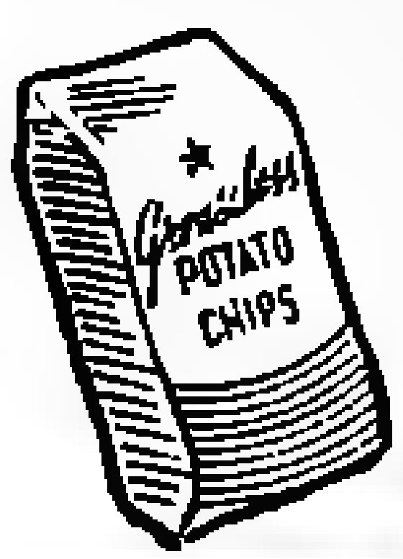
Literature will be sent only to persons stating their age.

INSTITUTE OF APPLIED SCIENCE
1920 Sunnyside Ave., Dept. 2355, Chicago, Ill.

QUICK CASH IN NEW POTATO CHIPS

START AT HOME

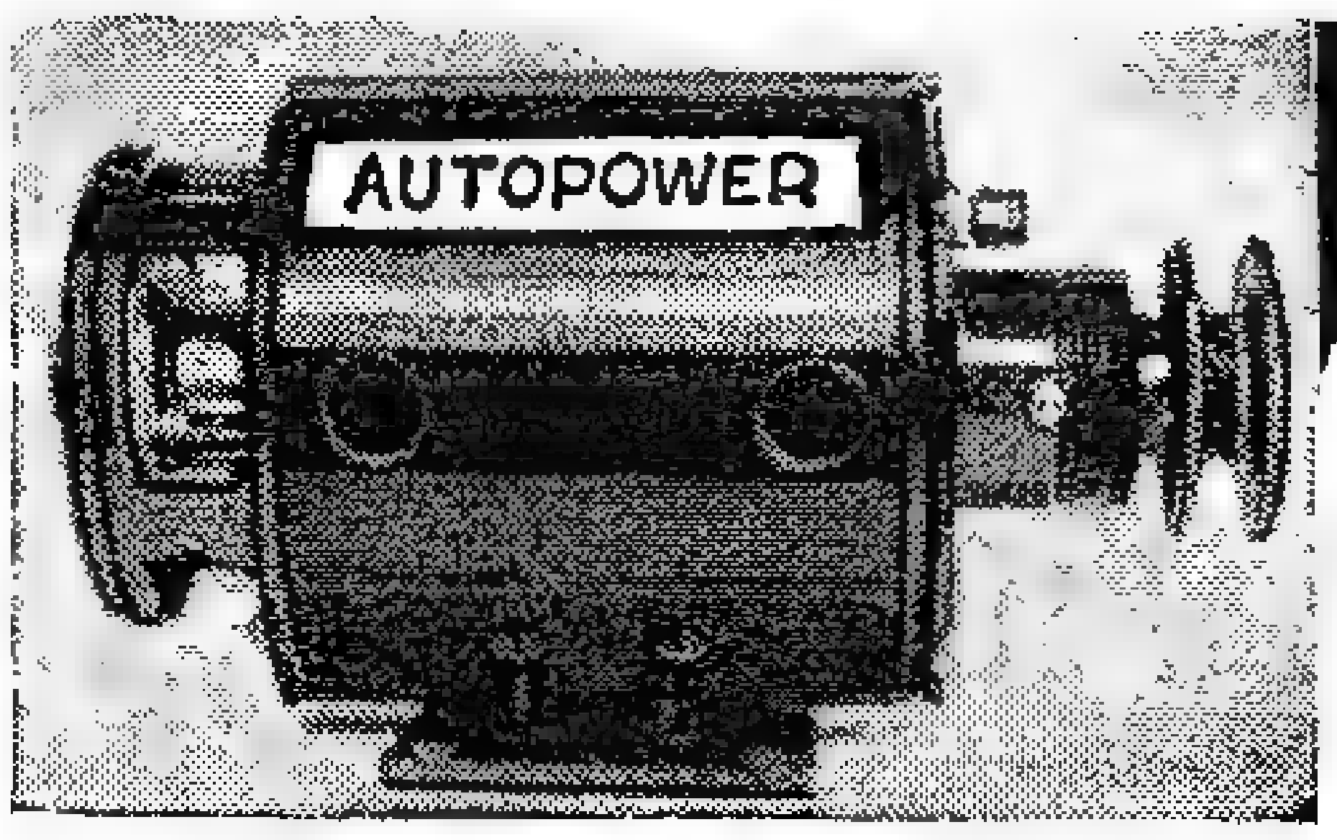
Here's your chance—a money-making business of your own. Turn potatoes into cash by making new kind of Potato Chips with my improved outfit. Makes delicious, superior, "NON-GREASY" Chips at low cost. A few hours practice does it. Begin anywhere—city, village, town. Potatoes cheap and plentiful. Wholesale or retail. Steady year 'round business. Groceries, markets, restaurants, taverns do the retailing for you.



WE HELP START YOU IN BUSINESS

Great quantities of Chips are eaten daily. Profit large—unusually so. You can start this money-making business on a "next to nothing" outlay of cash. Write for Potato Chip Booklet.

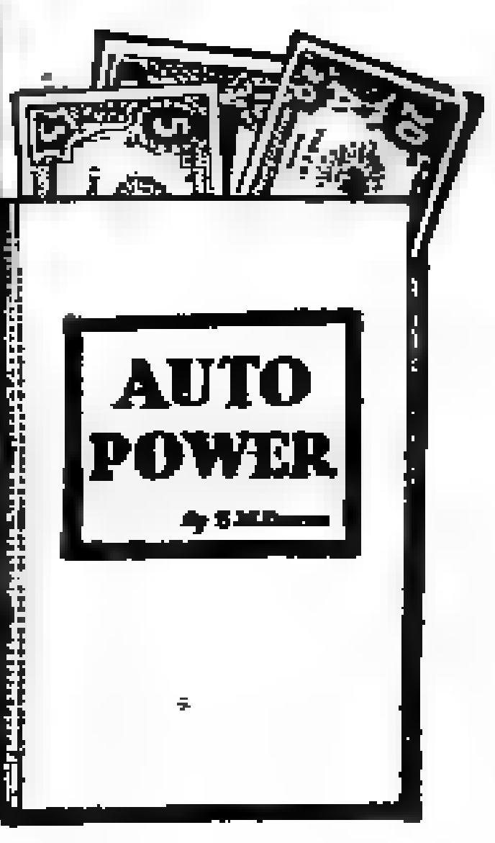
LONG-EAKINS CO., 542-6 High St., Springfield, Ohio

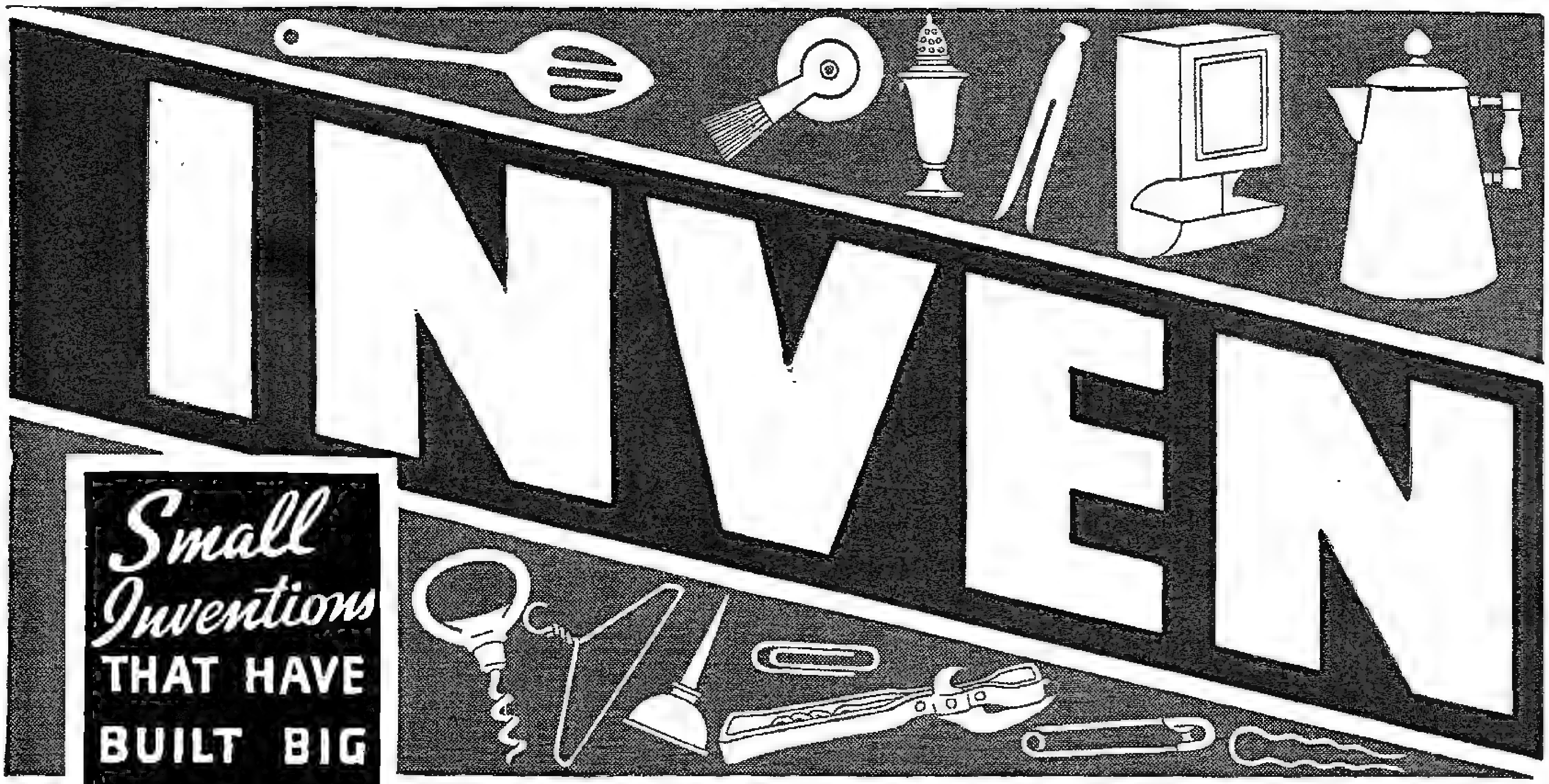


TURN SCRAP INTO MONEY

AUTOPOWER tells you how in plain, easy, simple and illustrated instructions that anyone can follow. Change auto generators into useful, practical A C and D C generators and motors with voltage from 2 to 1,000 volts, for power, light, welding, radio, sound, etc. No previous experience nor special tools needed. Generators can be driven by wind, water, fan belt, etc. INSTRUCTIONS FOR BUILDING AN A C WELDER THAT ACTUALLY WORKS UP TO A 3/16" ROD. ALSO COMPLETE PLANS FOR WIND AND WATER POWER PLANTS. Send for your copy of "AUTOPOWER." Already used and endorsed by thousands. Only $1.00 postpaid.

S. W. DUNCAN, Publisher **412 S. Hoyne Ave., Chicago**

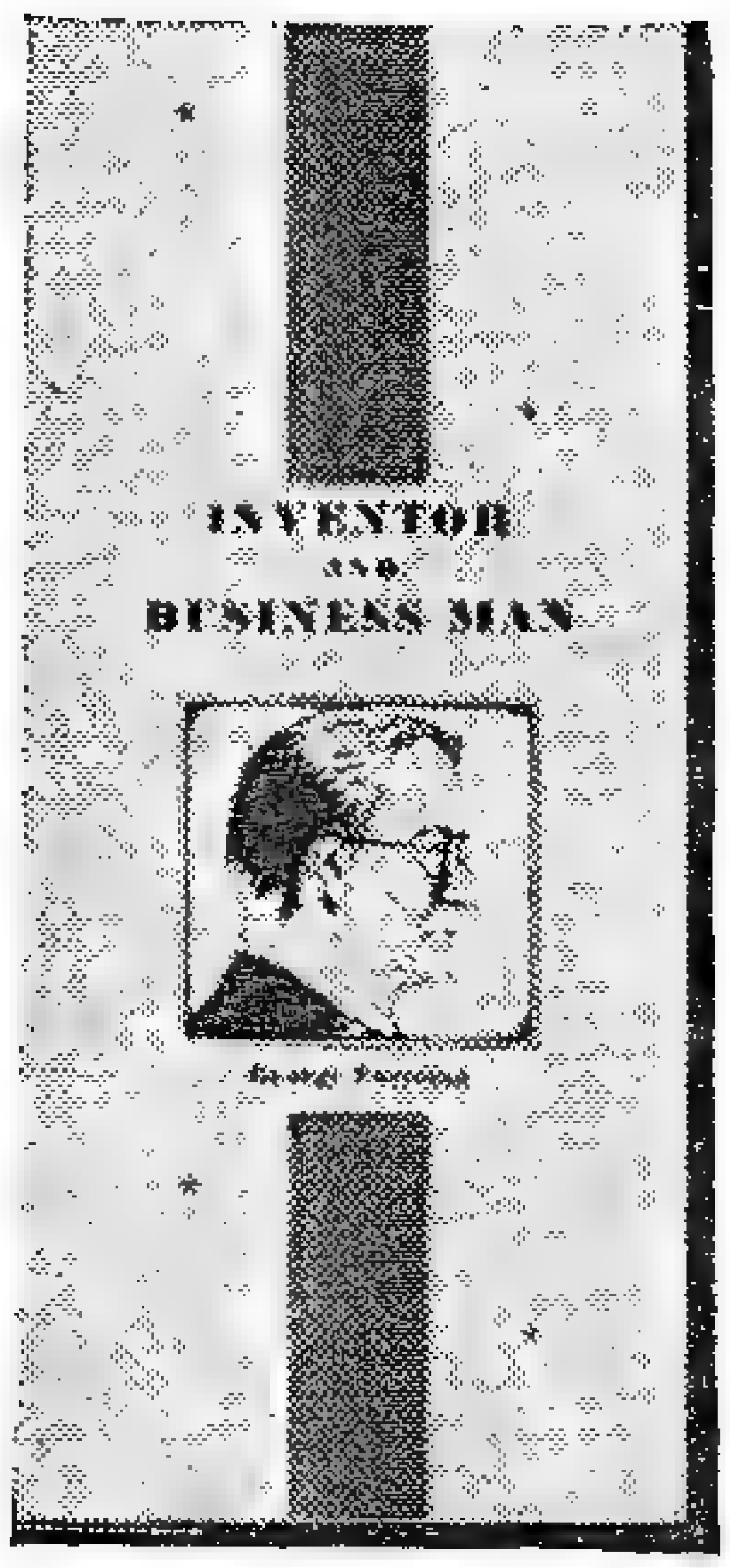




Small Inventions THAT HAVE BUILT BIG BUSINESSES

INVENTIONS do not have to be complicated to be profitable when Patented. The 5c and 10c stores flourish on simple Patented products which are commercially successful. The zipper, safety pin, thumb tack, paper clip, collar button—all simple, yet familiar inventions—brought their inventors rich rewards. If you have a Patentable invention—act to protect it. Many of the most useful, widely popular, greatly profitable, and extremely successful inventions have been very simple ones. You have only to look at the devices we have pictured here to realize how a simple invention may become a utility bought by a hundred thousand or a million people soon after it is produced. Don't be afraid that the simplicity of your invention makes it valueless. The thing that you find so simple that you wonder why a thousand other people haven't already done it is often the invention worthwhile.

HOW OTHER INVENTORS GOT STARTED



The list of men who succeeded in invention with only a poor boy's start is a very long and noble one. Poverty, hardships, lack of friends, distance from the market—these could not hold back Bell, Edison, Eastman, McCormick, Whitney and others. Everyone cannot succeed. But every man can try. Courage, sacrifice, and hard work may bring you a measure of the success these men had. Lack of mechanical ability is not a serious drawback. You can always get someone able to build a model, draw a detailed design, or otherwise materialize your invention for you. The big drawback is discouragement.

Your invention of a practical article or an improvement upon an old one should be patented NOW. Frequently many of the thousands of applications filed in the U. S. Patent Office each year are for the same or almost the same invention. In such a case, the burden of proof rests with the last application filed. Sometimes a delay of even a few days in filing the application means the total loss of the patent. LOSE NO TIME.

The entire time of this large and experienced organization is devoted exclusively to patent and trade-mark cases. We know the rules and requirements of the Patent Office. We understand the technicalities of Patent Law. We can proceed in the quickest and safest ways in preparing an application for a patent covering your invention.

FREE THE BIOGRAPHY OF GEORGE EASTMAN

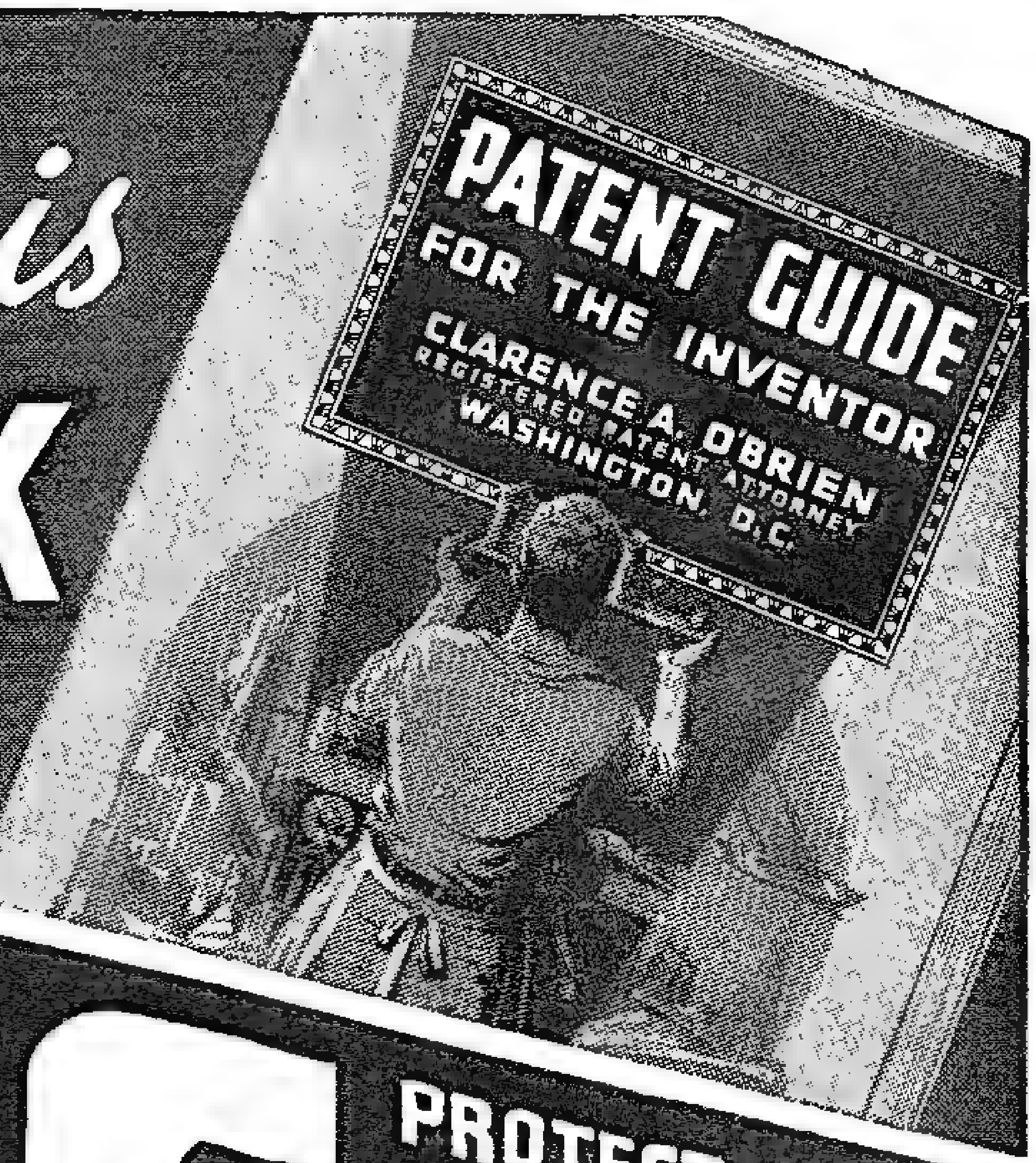
Views of the man who used Patent Protection to amass millions and give perfection to a new art—*Photography*—itself one of the greatest inventions.

CLARENCE A. O'BRIEN & HYMAN BERMAN

317-C ADAMS BUILDING WASHINGTON, D. C.

Registered Patent Attorneys Before U. S. Patent Office

Send For This FREE BOOK



TORS

PROTECT YOUR INVENTIONS WITH U.S. PATENTS

If you have an invention that is patentable—and want to secure for yourself your inventor's sole right to profit from the invention—you can't afford to lose time in securing the protection of a U. S. Patent. Other inventors may be working on the same invention right now. Should they develop this invention and file patent application before you do—the burden of establishing priority will be upon you. Our Big Book—"Patent Guide for the Inventor"—will tell you the quickest possible way to secure Patent Protection for your invention. SEND FOR IT TODAY!

The First Important Step in Securing a Patent

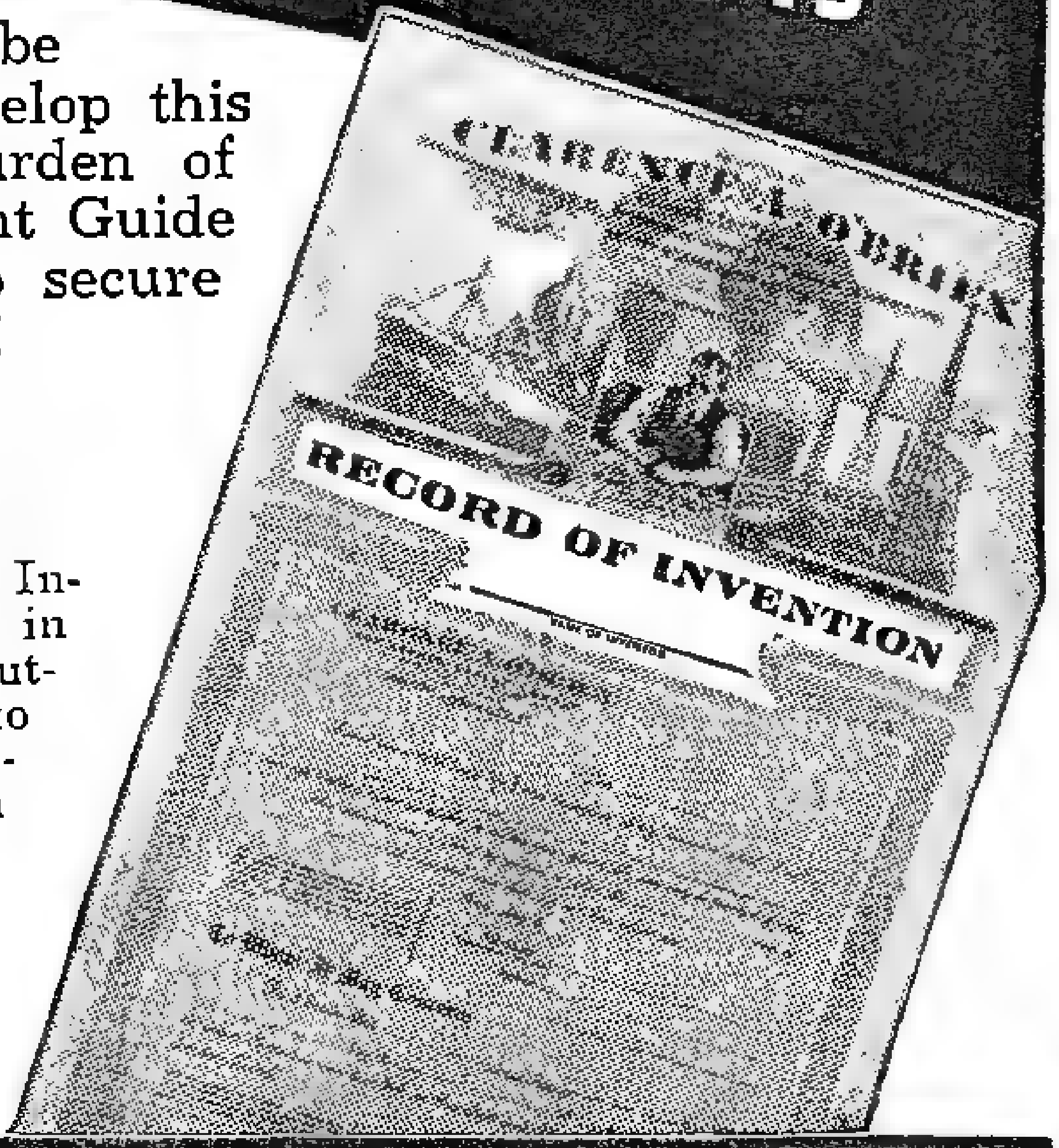
is to obtain the services of a Registered Patent Attorney. The U. S. Patent Office advises that you secure the aid of an experienced Registered Patent Attorney to prepare your statements. Establish the date of your invention as explained in our book and disclose your invention to him in correct form. He then makes a SEARCH of the Patent Office Records and reports to you on existing U. S. Patents which might bear on your invention, giving his opinion on the advisability of proceeding and filing formal application.

Reasonable Fees—Convenient Terms

Don't worry about finances. Our fees are very reasonable—we can arrange convenient terms of payment. It is our custom to permit clients to pay for our services in installments as the application progresses in our office. See our Big Book for fees in obtaining Patent. It explains our arrangements clearly. Send for it NOW!

FREE RECORD OF INVENTION FORM

Use our Free "Record of Invention" form to assist you in recording the descriptive outline of your invention and to establish the date of your invention. With it you can make a rough sketch of your invention and have it witnessed in a matter of value to you as evidence should occasion arise.



CLARENCE A. O'BRIEN and HYMAN BERMAN

317-C Adams Building, Washington, D. C.

Registered Patent Attorneys
Before U. S. Patent Office

Please send me at once your Big Free 48-Page Book, "Patent Guide for the Inventor" and your Specially Prepared "Record of Invention" form. This request does not obligate me.

Name ....

Address ....

....

(Please write or print plainly)

Thrilling NEW
EVINRUDE
"Ranger"
ONLY $47.50

A brand new Evinrude . . . amazingly light, handy and powerful. Literally *packed* with big-value features including famed Hooded Power — Evinrude Co-Pilot — Underwater Silencing. Starts *instantly!* — spins into action with a flick of the starting cord. Runs three hours on a single fill—and costs less than 3¢ an hour to operate. Send for catalog!

ELTO PAL *only* **$37.50**

Elto PAL (built by Evinrude) weighs only 14 pounds, and drives boats at twice the speed of oars. Elto ACE, $47.50—the husky Handi-twin, only $67.50. Each a stand-out value in its class!

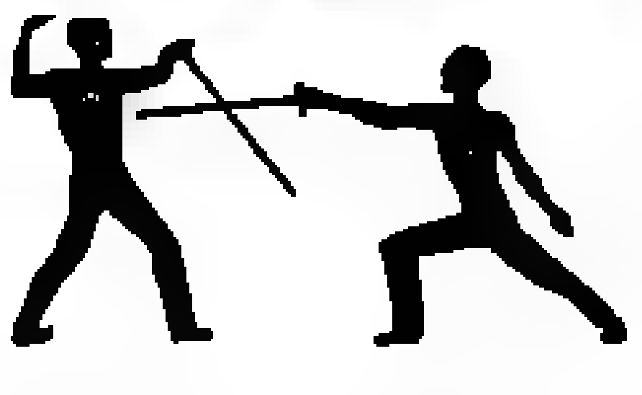
WEIGHS ONLY 16 LBS. CRUISES 3 HRS. ON A SINGLE FILL!

FREE CATALOGS! Write for 1938 Evinrude and Elto catalogs, Boat Directory and Boat-and-Motor Selector. All free. Address EVINRUDE MOTORS 5458 N. 27th St., Milwaukee.

PRICES F. O. B. FACTORY

EVINRUDE OUTBOARD MOTORS

FREE
SENSATIONAL OFFER
2 FENCING SWORDS FREE
FENCING
WORLD'S FINEST SPORT
EXCITING FUN-HARMLESS



Develops strong body and alert mind. **HARMLESS.** The spring-steel 3-foot-long foils (swords) are equipped with rubber buttons. Aluminum cup-shaped hand guards. Our De Luxe foils are built for hard usage.

Complete set of two foils (swords) and free instruction booklet, only $1.75 postpaid. Two additional fencing swords FREE for limited time. (Regular price of these two sets of foils $3.96.) ORDER NOW.

ALL-AMERICAN FENCERS GUILD
Dept. 5MM 48 West 48th St., New York, N. Y.

AUTO-MECHANICS & WELDERS

Auto Mechanics and Welders are in big demand. Complete courses in arc and acetylene welding, metal finishing, body and fender bumping, spray painting. Special low rates. Write today.

Write for FREE CIRCULAR

MICHIGAN TRADE SCHOOL
3763 Woodward Ave.. Detroit, Mich.

AVIATION NEEDS MEN

AVIATION IS CALLING YOU!
CALIFORNIA FLYERS INC.
SCHOOL OF AVIATION

Southern California, world's aviation center, needs trained men to build and fly planes. Only trained men accepted. Get quicker, lower-cost training at California Flyers, leading flying-mechanical school in this great aviation center. Secure steady employment, make big money, get the thrill of a red-blooded job in aviation.

CALIFORNIA FLYERS
LOS ANGELES, CALIF.

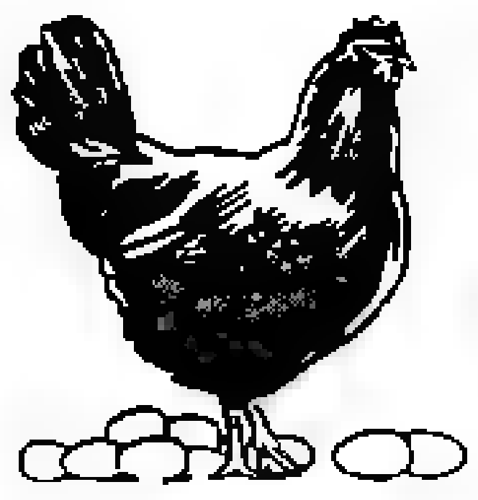
Send for California Flyers FREE Book
California Flyers, Los Angeles Municipal Airport, Inglewood, Calif.
Name________________________Age______
Address______________________________
City__________________State__________ MM-5

WOOD-WORKING SUPPLIES

EVERYTHING THE CRAFTSMAN NEEDS
ONLY 10¢

New 100 page book contains most complete list of woodworking supplies in the world—Standard American woods cut-to-size at bargain prices, Rare imported woods, Veneers, plywoods, inlays, carved legs, mouldings, decorations, Hard-to-find ornamental hardware, scroll saw patterns, wood-finishing instructions—How to make Venetian Blinds at 1⁄3 store prices. Send only 10¢ for Catalog No. 10 to **Craftsmen's Wood Service Co., 2727 S. Mary Street, Dept. 4735, Chicago, Ill.**

RAISE POULTRY
FOR PROFIT



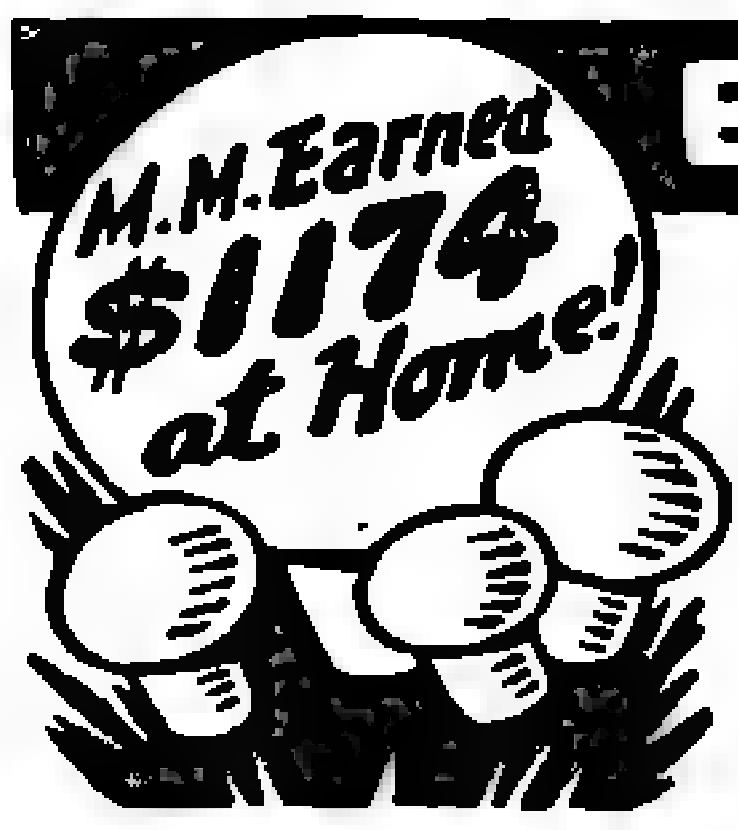
START AT HOME. MARKET WAITING. Garage, barn or backyard all that is needed. Learn latest methods from our Home Study Course and put cash in your pockets every day. We train you, help you. Get facts about our unusual offer NOW! Men and women making money in every state—town and country. Send for illustrated FREE BOOK today!

NATIONAL POULTRY INSTITUTE
Dept. 131-D Adams Center, N. Y.

Learn Photography at HOME

Splendid opportunities. Prepare quickly in spare time. Easy method. No previous experience necessary, common school education sufficient. Many earn while learning. Send for free booklet "Opportunities in Modern Photography", particulars and requirements.

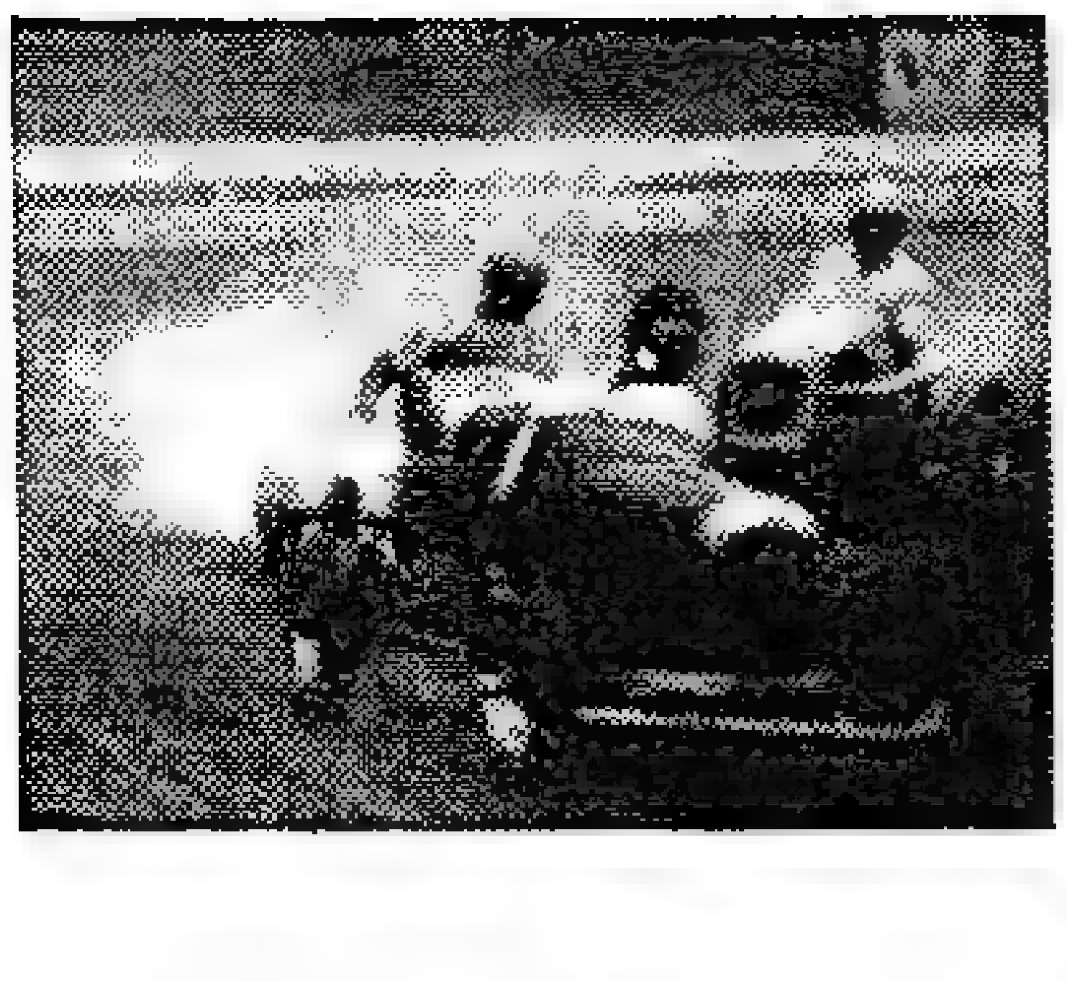
AMERICAN SCHOOL OF PHOTOGRAPHY
3601 Michigan Avenue Dept. 2055 Chicago, Illinois


M.M. Earned $1174 at Home!

Earn Cash *at* Home!

We paid M. M. $1174 for exceptional "cellar crop" SNOW-KING mushrooms! Big free picture book tells if your cellar, shed barn, suitable. We furnish materials, buy all crops through our 25 branches. Write today for "Guaranteed Success Plan," backed by $5000 bond. Est. 1908.

UNITED MUSHROOM CO.
3848 Lincoln Ave., Dept. 314, Chicago.

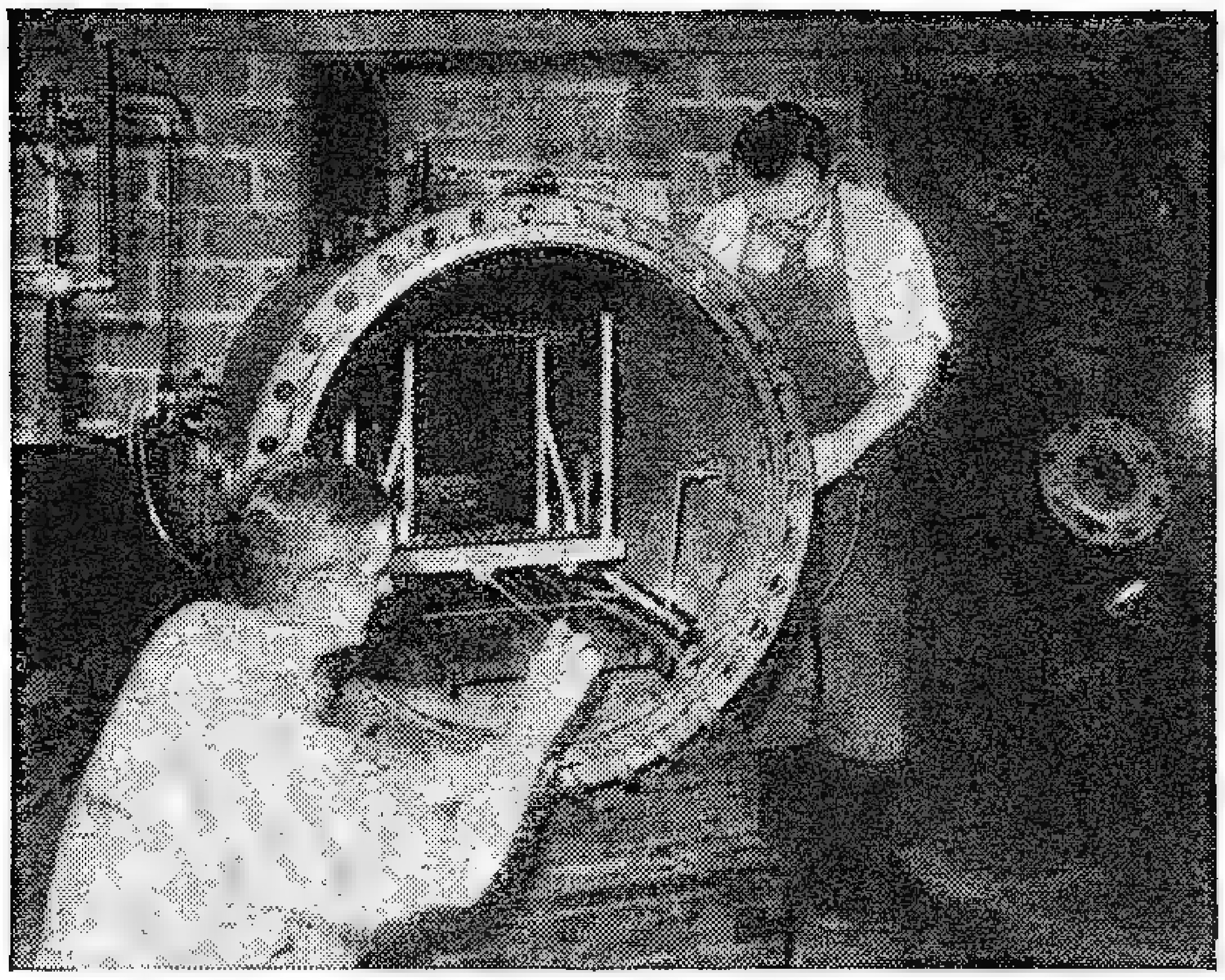


MIDGET RACING

Get full details on this thrilling sport: facts for fans, builders and drivers; track sizes and regulations; car specifications, pictures and working drawings. This book also shows and tells about Indianapolis cars, Miller-Fords and world's fast cars. AUTOMOBILE RACING, Fourth Edition, $1.00 postpaid, $1.15 C. O. D.

RAY F. KUNS, Dept. A-17,
Madisonville, Cincinnati, Ohio.

Device Calibrates Voltage Of Powerful X-ray Machines



The super-voltage X-rays used in treating deep-seated cancers can be accurately standardized for the first time, the U. S. Bureau of Standards has announced. Measurements up to 400,000 volts have been made for such standardization by two scientists of the Bureau's staff, Dr. Lauriston S. Taylor and George Singer.

The significance of the work, Dr. Taylor reports, is that it takes the "chance" out of previous work in the field of high-voltage X-ray therapy. Previous experimenters have used 400,000-volt X-ray without knowing, truly, what dosage they were administering. They obtained different results with the higher voltage rays but were unable to know whether the effect was due to the characteristics of the more piercing radiation or to inequalities in X-ray dosage. The new Bureau of Standards work permits dosages of radiation up to 400,000 volts to be known accurately for the first time. Previously 275,000 volts was "tops" for such calibration work.

To measure the rays, a tube of special design was constructed and one of the world's largest pressure X-ray ionization chambers (shown above) was built.

This research was necessitated by the building and operation, within the last three years, of several dozen X-ray plants operating at the higher voltages. Previously X-rays generated by voltages up to 200,000 volts were used in treating cancer and other serious diseases.

It is being predicted that airplanes have reached their top speed, so far as commercial flying is concerned.

NOTICE

Changes in the make-up and title of this magazine will become effective with our next issue. Reserve your copy now. Our new name will be—"Mechanix Illustrated."

RAILWAY MAIL CLERK
GOVERNMENT CLERK
MAIL CARRIER
POSTOFFICE CLERK

U.S. GOVERNMENT JOBS

Start $1260 to $2100 a Year
42,766 APPOINTMENTS IN 1937 GOV'T YEAR

Railway Postal Clerks

Railway Postal Clerks get $1,900 the first year regular, being paid on the first and fifteenth of each month. ($79.17 each pay day.) Their pay is automatically increased yearly to $2,450. Advance may be had to Chief Clerk at $2,700 a year. ($112.50 each pay day.)

3 Days On—3 Days Off—Full Pay

Railway Postal Clerks on long runs usually work 3 days and have 3 days off duty or in the same proportion. During this off duty their pay continues just as though they were working. They travel on a pass when on business. When they grow old, they are retired with a pension.

City Mail Carriers, Post Office Clerks

Clerks and Carriers now get $1,700 the first year on regular and automatically increase $100 a year to $2,100 and $2,300.

Customs Inspector

Salary $2,100 to start. Men 23 to 45. Work connected with examining baggage and merchandise entering the country from foreign parts covering boats, trains, roads, automobiles, etc.

CUSTOMS INSPECTOR

Many Other Positions

Many other positions are obtainable. Those wishing these positions should qualify at once.

Get Free List of Positions

Fill out the following coupon. Tear it off and mail it today—now, at once.

This investment may result in your getting a big-paid government job.

FRANKLIN INSTITUTE, Dept. P262, Rochester, N. Y.

Rush to me, entirely free of charge (1) a full description of U. S. Government Jobs; (2) Free copy of illustrated 32-page book, "How to Get a U. S. Government Job"; (3) List of U. S. Government Jobs; (4) Tell me what to do to qualify for a U. S. Government Job.

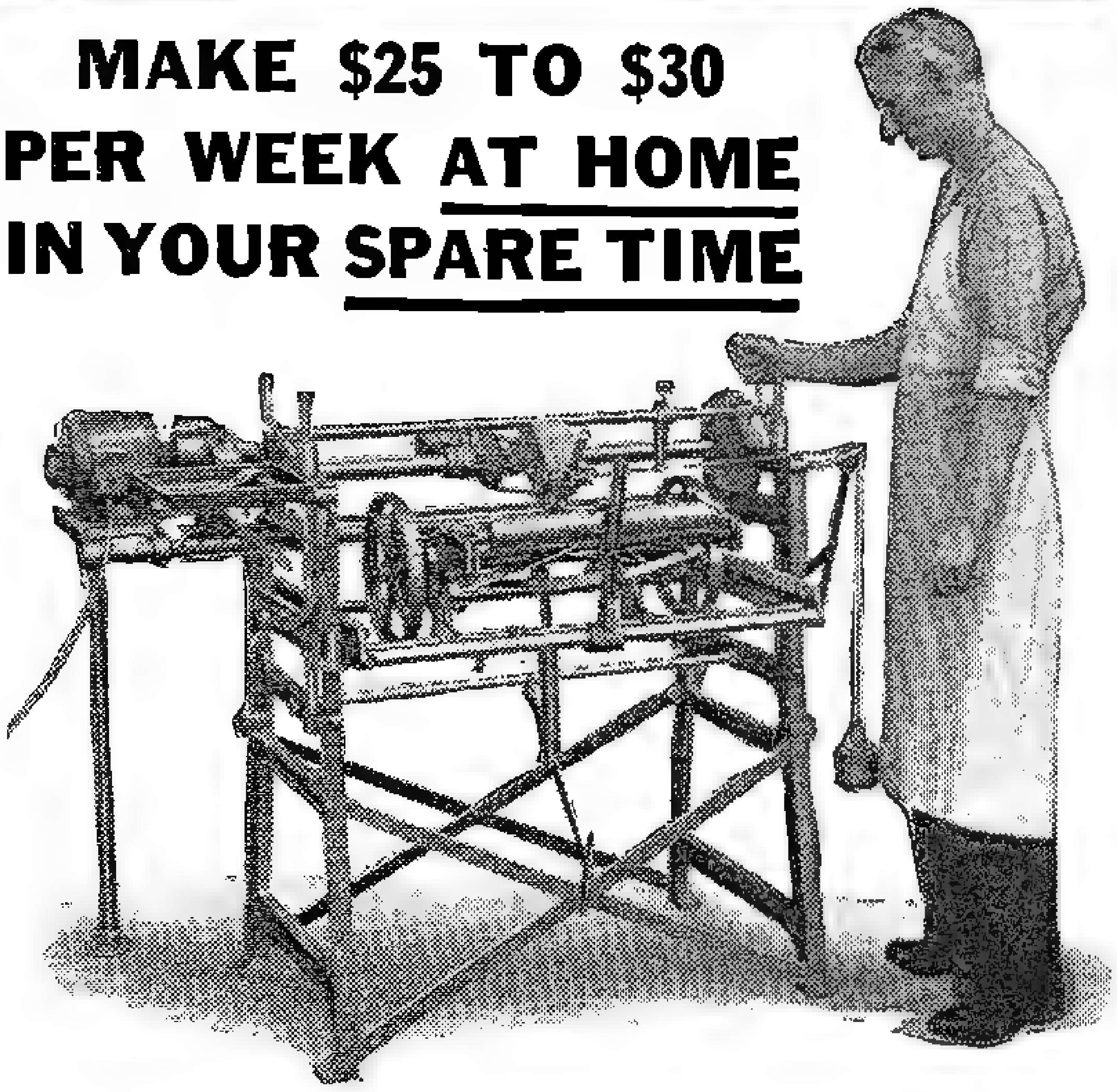
Name ....

Address ....

Use This Coupon Before You Mislay It. Write or Print Plainly.

★ *Cash* FOR SPARE TIME!

MAKE $25 TO $30
PER WEEK AT HOME
IN YOUR SPARE TIME



THE IDEAL LAWNMOWER SHARPENER

Like magic, the Ideal Lawnmower Sharpener makes old, dull, half worn-out mowers cut like new. Simply set the mower in the Ideal and the machine does the rest. Sharpens any lawnmower to a perfect edge in 15 to 20 minutes, usual charge $1.00 to $1.50. Attach to light socket. Start in your basement or garage. Work in spare time. Attachments furnished for grinding skates, grass shears, hedge shears, sickles, scythes, axes, etc. FREE CATALOG tells complete story.

WHAT THESE MEN DID .. *You Can Do*

Remember, no experience is necessary. Most men sharpen lawnmowers in spare time only J. B. Van Dien writes: "Some weeks I earned $40 a week with my Ideal just as a side line." George Seitel writes: "I have sharpened over 500 mowers and every customer is well pleased." A. M. Larsen writes: "I average 9 mowers a day." Roy F. Stier says: "I live in a town of 500 and to-date have sharpened 200 mowers at $1.25." Edward A. Mynderse writes: "Have sharpened around 500 mowers this season." Nick Baltes says: "Last summer I sharpened 200 mowers at $1.00 each." Rucher Battery Co. write: "We sharpened over 600 mowers last year at $1.50 each."

HOW TO MAKE $25 to $30 PER WEEK IN SPARE TIME

FREE BOOK Shows how!

Right now, before you forget it, send for a copy of our FREE BOOK, "How To Make $25 to $30 per week in SPARE TIME."

SEND POST CARD TO

THE FATE—ROOT—HEATH CO.
328 Bell Street, Plymouth, Ohio

MAKE MONEY IN YOUR WORKSHOP
Build furniture, auto trailers, canoes, iceboats, cruisers, sailboats and electric refrigerators described in
FREE BLUEPRINT BOOKLET
MODERN MECHANIX PUBL. CO., Fawcett Bldg., Greenwich, Conn.

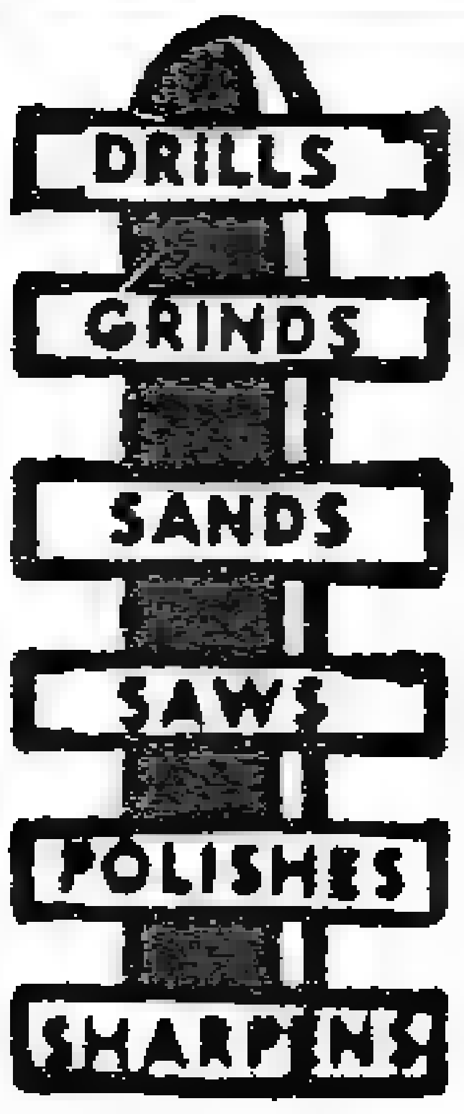
Law!

LEARN AT HOME

Are you adult, alert, ambitious, willing to study? Investigate LAW! We guide you step by step—furnish all texts, including 14-volume Law Library. Training prepared by leading law professors and given by members of bar. Degree of LL. B. conferred. Low cost, easy terms. Send NOW for Free, 64-page "Law Training for Leadership."

LASALLE EXTENSION, Dept. 5493-L, Chicago

SUPER-TOOL OF 1000 USES



ONLY $6.95 POSTPAID

The new WHIZ ELECTRIC TOOL is the handiest, most useful power tool ever made. Not a delicate instrument but a real rugged tool, equally effective for both power and precision work. Drills through ¼ inch iron plate in 42 seconds or engraves intricate designs on jewelry. Handles any material: Metals-Woods-Alloys-Plastics-Glass-Steel-etc. Saves time. Eliminates tedious labor. Plug into any socket AC or DC. 110 volts. Chuck ¼" capacity. Ball bearing thrust. Powerful, triple-geared motor. "Worth its weight in gold." to mechanic or handy man. STANDARD MODEL with Normal Speed (uses 50 different accessories, instantly interchangeable) only $6.95.

FREE Accessory outfit (Value $2) includes set of drills, mounted 1½" grinder, sanding discs, cutting wheels, mounted brush, polishing wheel, etc. FREE with each outfit ordered NOW. We pay postage on all shipments. Will send C.O.D. if desired. 10 DAY TRIAL—MONEY BACK GUARANTEE. Special "2-SPEED" MODEL combines Normal Speed and High Speed in one outfit (uses 200 accessories) only $8.95 complete, with above accessories and carving bur FREE.

PARAMOUNT PROD. CO., Dept. 5-B, 48 W. 84th St., New York

LEJAY WELDER Now Only $1.00

$1.50 foreign POSTPAID

Complete kit of parts for making our genuine LeJay Welder which has proved such a sensation. Thousands sold to satisfied customers at $2.50 each. LeJay now offers this famous tool in kit form at a saving of $1.50. Easy to assemble—no other parts needed. Operates from car battery. Intense heat welds most metals. Your first repair job will more than pay the small amount you spend for this amazing tool. Send $1.00 for your welder today. Satisfaction guaranteed or money refunded. We also ship C. O. D.

LEJAY MFG. CO., 314 LeJay Bldg., Minneapolis, Minn.

LES AD ASTRA PER ARDUA

Correspondence Courses In
RADIO and ELECTRICAL ENGINEERING

SPECIAL Only $25

ELECTRICAL ENGINEERING Get good grasp of wide electrical field. Prepare yourself, at Low Cost, for secure future. Modern course. So simplified anyone can understand quickly.

RADIO ENGINEERING Extra fine course in radio, public address, photo-electric work. Trains you to be super-service man, real vacuum tube technician. Experimental kits furnished. Diploma given on completion. Tuition, ONLY $25, either course. Deferred payment plan available.

FREE! Send name quick for free copies of school catalogs student magazines, complete details. SEND NOW.

LINCOLN ENGINEERING SCHOOL, Box 931-77, Lincoln, Nebr.

STOP *Backtracking*

Haven't you often driven the wrong road and had to backtrack many miles? The Hull Streamline Auto Compass always shows your direction of travel, prevents backtracking, saves money and time for only $2.95 at your dealer. Two-piece model $1.95. Write for circular.

HULL MFG. CO., P. O. Box 246-M; WARREN, OHIO

CARTOON YOUR WAY TO SUCCESS!

DON'T COPY - LEARN TO ORIGINATE!

RAYE BURNS will teach you HOW to CREATE ORIGINAL CARTOONS at home that you can SELL! Course has 26 lessons and 600 illustrations. *Send name and address for free details.* Only.... $3.85

RAYE BURNS SCHOOL, Dept. F, Box 2194, Cleveland, Ohio

MAKE MONEY AT HOME

RUBBER MOLDS *Low as* 6¢ EA.

Amazing rubber mold-making outfit makes perfect flexible molds of plaques, ash trays book-ends, etc. Molds cost from 6c to 25c each. Each mold makes hundreds of novelties and gifts to sell up to $1.00 apiece! No experience necessary. Everything furnished. Start profitable business in your home . . . sell to stores, friends, resorts, road stands or by mail—NOW! Make BIG MONEY full or spare time. Write for complete FREE details and easy instructions. **SO-LO WORKS, Dept. E-834, Cincinnati, Ohio.**

Water Tank Will Serve As Wind Tunnel For Airships

AIDED by the Navy Bureau of Aeronautics, Dr. Arnold M. Kuethe and his associates of the Guggenheim Airship Institute in Akron, Ohio, are building a water tank which will serve as a wind tunnel for airships. The tank, which will measure five feet by eight feet when completed, will be equipped with apparatus to simulate wind gusts by means of a water jet.

A water tank and a submersible model of an airship must be used in the tests, because the model and the medium in which it is moving must have nearly the same density. A tiny "lighter-than-air" model would be too difficult to construct and handle. Since mechanical difficulties render the lighter-than-air model impractical, a water tank and a submersible model can be used equally well.

Studies of what happens to an airship when a gust of wind hits it will be carried out and the experiments will serve to throw new light on why many big airships of the past have been defenseless against storms. The Society of Rheology, which is interested in the experiments, is a group of physicists and engineers interested in studying the flow of materials such as gases and liquids.

Designer Of Mercury Vapor Engine Stresses Its Value

William L. R. Emmet, designer of the Emmet mercury vapor engine, which uses mercury vapor much as an ordinary steam engine uses steam, claims that his type of engine, if applied to vessels like the "Normandie" would result in fuel and space savings of several hundred thousand dollars a year.

The mercury engine, which has been used to run a power plant at Hartford, Conn., is theoretically more efficient than steam because of the fact that mercury boils at a much higher temperature than water. The efficiency of a steam engine depends on how hot the steam is. Chief hindrance thus far to its acceptance by engineers has been the fact that installation of the mercury engine is extremely expensive because of the high price of mercury. Once installed, however, the mercury does not need to be replaced and it produces more power per pound of fuel than steam does.

NOTICE

Changes in the make-up and title of this magazine, designed to make your favorite publication better than ever before, will become effective with our next issue. Be sure and reserve your copy now. Our new name will be—"MECHANIX ILLUSTRATED."

You'll be amazed at the speed with which you can learn in your spare time by Engineer Dobe's Proven-Practical "Work - Job" Method.

HERE'S A JOB!

If you want to learn drafting as a profession—or if you want to learn drafting to advance in your present work—Engineer Dobe can train you at home in your spare time by his long established, proven-practical "Work-Job" Method.

Send coupon TODAY for free book entitled "Success in Draftsmanship."

LEARN DRAFTING

AT HOME From Engineer Dobe

Engineer Dobe can prepare you just as he has trained thousands of successful students, aged 16 to 18 to past 50. His practical "Work-Job" method requires no previous experience. High school education not needed. He offers you a real opportunity to get a complete training in drafting right in your home in a surprisingly few months. Engineer Dobe teaches his students until thoroughly trained and until holding a good paying job.

DRAFTING means OPPORTUNITY

Modern industry begins with the draftsman. The drafting room is the nerve center of manufacturing, building and transportation. New inventions, new designs, new plans, basic improvements must begin with the draftsman.

The draftsman has rich opportunities for advancement and better pay in scores of fields. In Machinery, Building, Aviation, Electricity, Transportation, Automotives—draftsmen must be used. Many trained draftsmen will be needed on better jobs at better pay and shorter hours.

Send For FREE BOOK

Mail the coupon today for FREE illustrated book "Successful Draftsmanship" and full details of Engineer Dobe's remarkable offer that includes all necessary tools and equipment. Learn just how you can be trained successfully at home in your spare time. Time is money. Now is the time to prepare. Don't wait another day. Send the coupon NOW for Engineer Dobe's FREE Book.

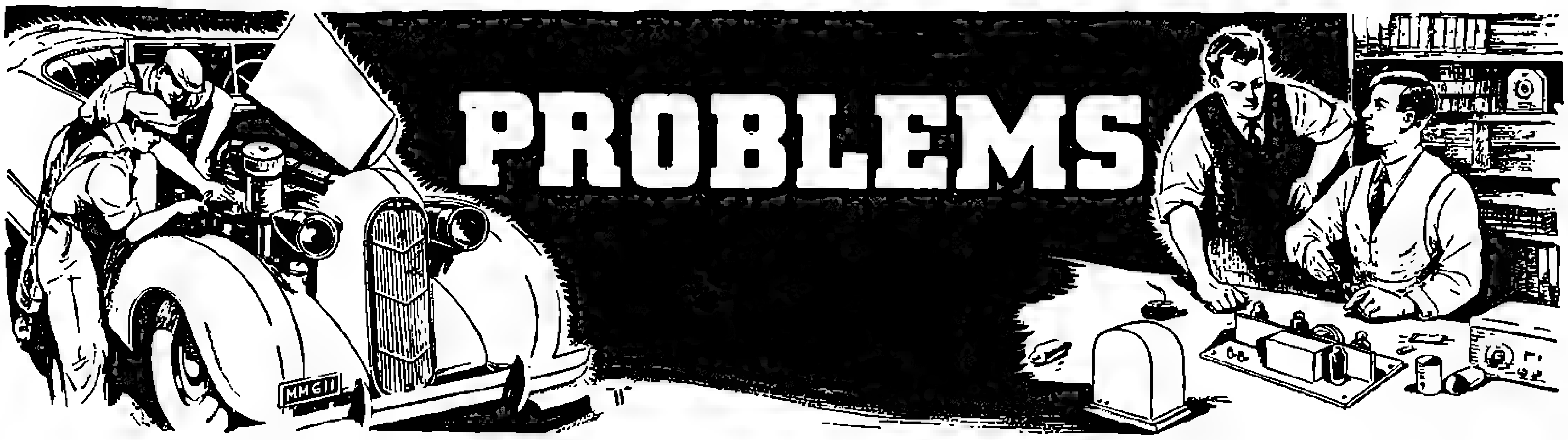
ENGINEER DOBE, Div. 4735, Libertyville, Ill.
Send me your free book "Successful Draftsmanship." Please explain how you assist your graduates to good positions as draftsmen.

Name ____________

Address ____________

Town ____________

State ____________ Age ____________



PROBLEMS

Editor's Note: Your questions will be answered personally and free of charge by MM experts provided they do not require special research or involve trade secrets. Names and addresses of manufacturers of new products described in this issue can also be obtained free upon request. Enclose a self-addressed and stamped envelope for reply. Address: Problems Editor, Modern Mechanix, 1501 Broadway, New York City.

HOW TO ASK QUESTIONS

Every day the Problems Department receives scores of letters in which are asked questions relating to articles which have appeared in MODERN MECHANIX, as well as questions on subjects of particular interest to individual readers. In both cases, MODERN MECHANIX editors are willing to be of as much assistance as possible—BUT the reader must not expect the impossible.

Assistance can be given only when the reader asks a fair question.

For example, a short time ago a letter was received in which the following question was asked: "I saw a man looking for a place to dig a well and he carried a short piece of wood in the shape of a 'Y'. Under his arm he carried a can. Please tell me what was in the can."

The reader's curiosity could have been satisfied immediately if he had asked the question of the man carrying the can.

Another type of question, more common but quite as impossible to answer, is the one in which the question applies to an article in MODERN MECHANIX but does not identify the issue. For example, "I am building the radio set described in MODERN MECHANIX and instead of using the tuning condenser you recommend, I would like to use one of smaller size. Do you think this will be all right?"

During the years MODERN MECHANIX has been published, many radio sets have been described. The editors have no means of knowing from the question which receiver the writer is building.

The editors therefore must write to the builder and ask him to identify the set either by name or the year and month of the issue in which it appeared. Time would have been saved by everyone concerned if the writer had taken the trouble to mention the exact issue carrying the article.

When a reader is constructing something from plans published in MODERN MECHANIX, the editors are more than pleased to help when problems arise during construction. We are pleased to help for two reasons: First, we like to be of service to our readers, and second, we like to have MM projects completed satisfactorily.

The question previously mentioned brings us to another important point applicable in varying degrees of importance to all how-to-build articles: "How can I change the design, size, speed, etc., of blank project?"

To almost every question of this type, the answer must be **"You can't."** It is true that if a table is described as being thirty inches high, the builder can make it twenty-nine or thirty-one and the table will be just as good. But unfortunately, the average builder does not wish to make changes as simple as this. He usually selects projects not lending themselves to changes without serious effects. For instance, every day's mail brings many letters from good-intentioned boat builders who select a certain boat and ask our advice on increasing or decreasing the size of the hull, increasing the speed by using an engine of greater horsepower, changing the sail area, redesigning the cabin, or "improving" any one or more of a dozen points.

To every question of this type the answer must be the same: "Follow the plans unless you feel competent to redesign the boat."

To many builders, this answer may seem harsh and disappointing. With those builders we sympathize because it is not difficult to understand that the future boat owner may wish to increase the speed of a boat by using an engine of higher horsepower. However, the answer remains "No." Each boat was designed for certain general speeds, and the mere addition of power may not give the result desired. And as to giving answers to questions of the speed of a boat with another engine—that is impossible. Frankly, we don't know. Any answer we would give would be the result of a guess, and our readers can guess just as easily as we can.

Then too, many readers wish to change the dimensions of a boat. They select a boat of certain size and then ask us how to change it so that it will be eight feet longer. Such a procedure should not be attempted by anyone but a competent designer, because this is a problem of design more than one of construction. To supply the builder with a new set of drawings and construction details would cost far more than the reader would care to pay.

Balance in a boat is a delicate and certainly an important quality. Therefore, do not expect to change an inboard to outboard type, and vice versa, without being prepared to undertake the problem of re-establishing its balance as well as every other characteristic the boat may have. Even slight deviations from the plans in this matter may change what would have been a completely satisfactory craft into one suitable only for sinking at the first opportunity.

A short time ago a reader wrote to us to tell us that he had built "Scram" but instead of the engine recommended —one of 40 to 50 horsepower—he was going to install one of 125 horsepower, and "how far from the stern should it be placed?" The editors knew that it should be placed much further from the stern than that builder suspected. In fact, it should have been placed out of sight, because "Scram" probably would shudder every time it came within fifty feet of a power plant of this size.

Many readers would do well to read directions carefully before attempting to build a boat. If a man knows nothing about boats, understands no construction or nautical terms, he should spend some time learning the fundamentals before embarking on actual construction work. The editors have

[*Continued on page* 21]

AUDELS NEW 1938 AUTO GUIDE

ANSWERS YOUR QUESTIONS!

Practical Information in Handy Form, 1540 Pages —1540 Illustrations.

KNOW YOUR CAR!

AUTO REPAIRS & SERVICE HELPS

All the Parts of an Automobile—Automotive Physics—The Gas Engine—How a Gas Engine Works—Gas Engine Principles—Multi-Cylinder Engines—Horse Power—Automobile Engines—Engines: Stationary Parts—Engines: Moving Parts—Pistons—Piston Rings—Connecting Rods—Crank Shafts—The Valves—The Valve Gear—Cams and Cam Action—Valve Timing—Cooling Systems—Gasoline—Fuel Feed Systems—The Mixture—Carburetors—Automatic Choke—Super-Chargers—Transmissions—Synchro-Mesh—Clutches—Universals and Propeller Shafts—The Differential —Rear Axles—The Running Gear—Brakes—Wheel Alignment—Knee Action—Steering Gear—Tires —Lubricants and Lubrication —Automotive Electricity—Ignition Systems—Magneto Ignition—Spark Plugs—Ignition Coils—Distributors—Automatic Spark Control—Ignition Timing—Generators—Starters—Generator and Starter Testing—Lighting Systems—Storage Batteries—Battery Charging—Battery Testing Troubles.

AUTOMOTIVE DIESEL ENGINES
Including Questions and Answers

The contents is progressively arranged; thus making it a text book and a reference book, to which you will refer again and again.

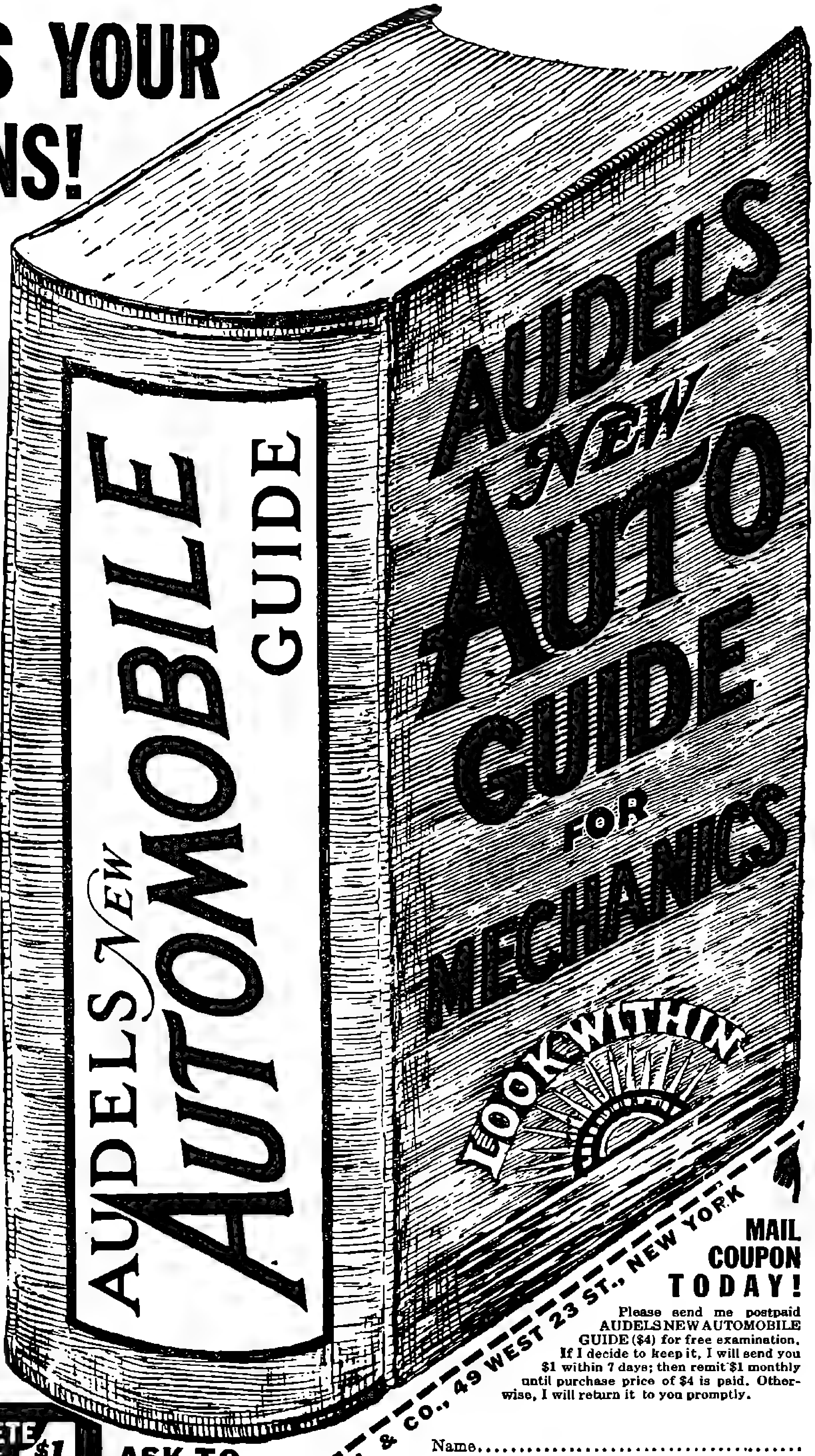
INSIDE VIEWS OF ALL AUTOMOBILE PARTS FULLY ILLUSTRATED.

GOOD NEWS—JUST OUT

AUDELS NEW AUTOMOBILE GUIDE is NEW from cover to cover. Explaining the Theory, Construction and Servicing of modern motor cars, trucks and buses; and the application of auto type Diesel Engines.

Written by an engineering authority and presented with forceful directness in plain language and simple terms, generously illustrated. It is an up-to-date authoritative book of instructions giving a new vision of the automotive field. Covers the entire subject in every detail. Does not deal in idle theories, but gives definite directions telling exactly what to do and how to do it. It is packed full with important information, indispensable to auto mechanics, service men and owners.

TO GET THIS ASSISTANCE FOR YOURSELF SIMPLY FILL IN AND MAIL COUPON TODAY


AUDELS NEW AUTOMOBILE GUIDE
AUDELS NEW AUTO GUIDE FOR MECHANICS
LOOK WITHIN

FOUR DOLLARS COMPLETE
$4
1540 PAGES
1540 ILLUSTRATIONS
FLEXIBLE BOUND-HANDY SIZE
$1 PER MO.

ASK TO SEE IT!

AUDEL, PUBLISHERS, 49 West 23rd Street, New York City

MAIL COUPON TODAY!

THEO. AUDEL & CO., 49 WEST 23 ST., NEW YORK

Please send me postpaid AUDELS NEW AUTOMOBILE GUIDE ($4) for free examination. If I decide to keep it, I will send you $1 within 7 days; then remit $1 monthly until purchase price of $4 is paid. Otherwise, I will return it to you promptly.

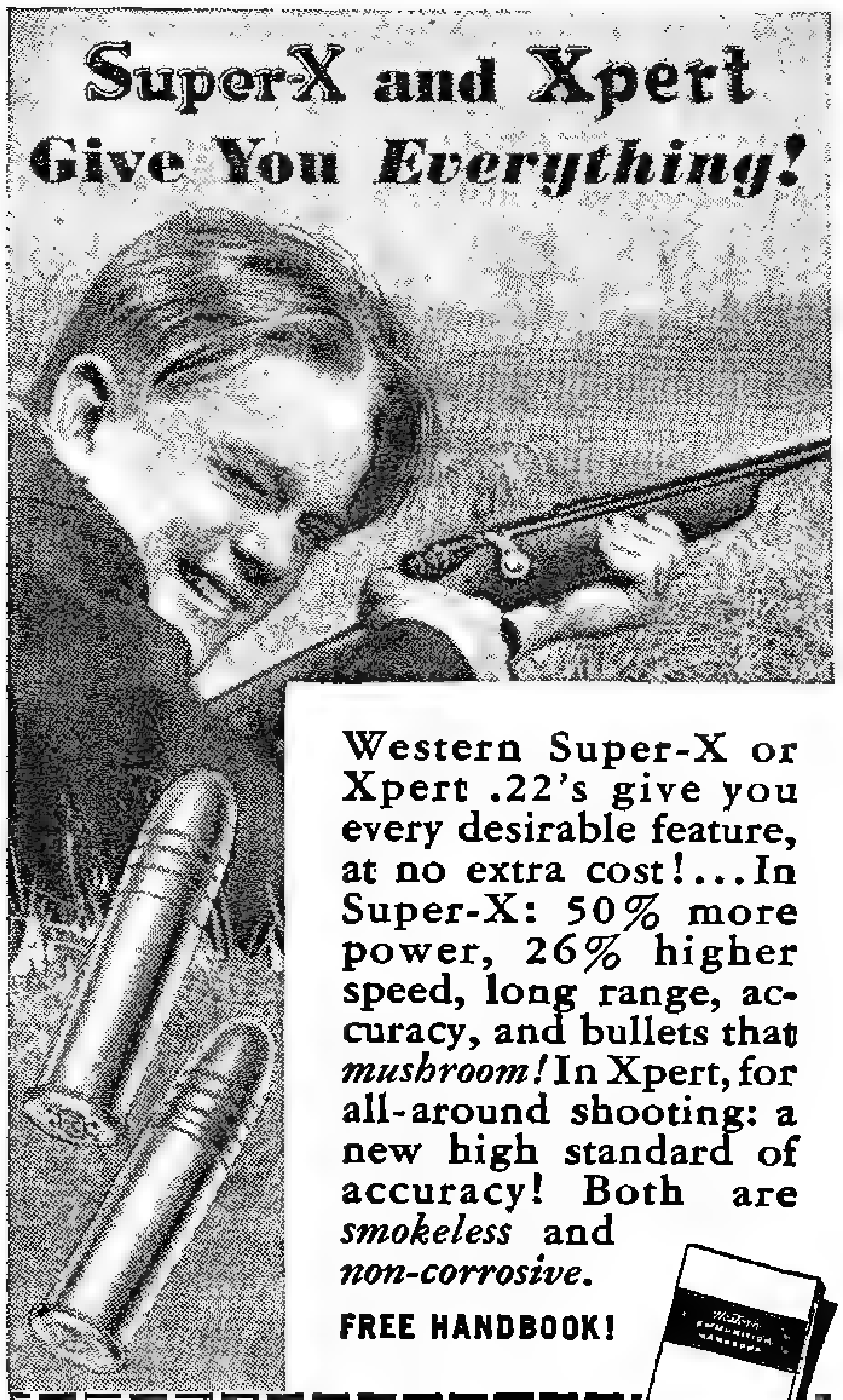
Name..

Address..

Occupation..

Reference..M M

Super-X and Xpert Give You *Everything!*



Western Super-X or Xpert .22's give you every desirable feature, at no extra cost!...In Super-X: 50% more power, 26% higher speed, long range, accuracy, and bullets that *mushroom!* In Xpert, for all-around shooting: a new high standard of accuracy! Both are *smokeless* and *non-corrosive.*

FREE HANDBOOK!

Western Cartridge Company,
Dept. E-105, East Alton, Ill.

Send, FREE, the 72-page Western Ammunition Handbook. A complete shooting guide. Tells all about all Western cartridges and shot shells.

Name..
Address..
Post Office....................State..........

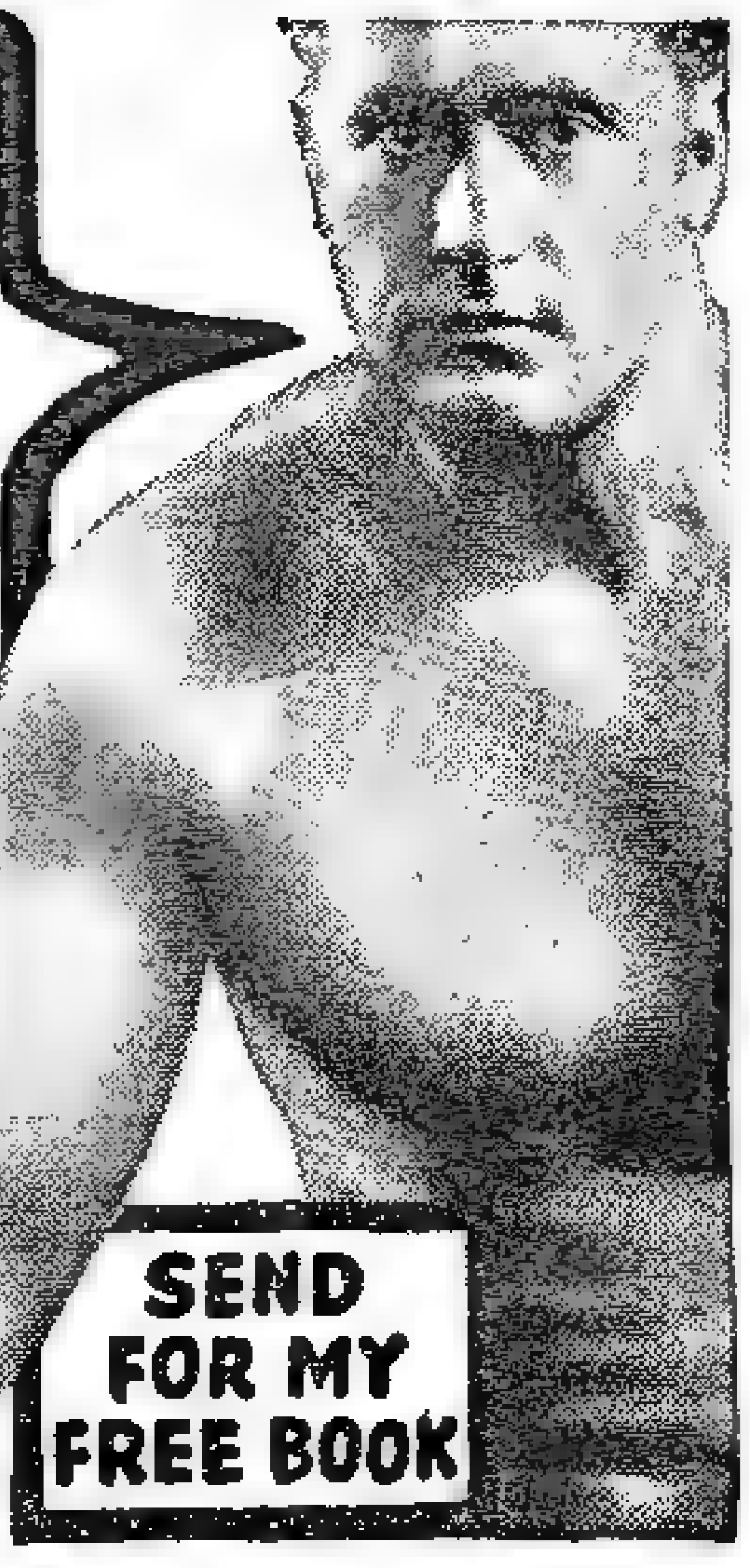
NEW! SENSATIONAL

ELECTRIC OR GAS "PUDDLEJUMPER"

$59.50 UP

3 new models including a 3 wheel "Powertrike." Runs 5 miles for 1c! No gas, oil, noise or clutch on electric type. Instant action! Variable and "Superpower" speeds to 40 m.p.h.! Perfectly controlled by anyone without experience! Lights, horns, brakes, windshields, "Carrypacks," etc. **PLENTY OF POWER!** Charger self-contained in scooter—charge anywhere—just plug it up to any light socket! (patented) Unusual range. Heavy balloon tires and spring frame give **AUTO SMOOTH RIDE! ULTRA STREAMLINED!** "Powertrike" has complete finger control and reverse gear! Will run over 100 miles per charge—built for real service! Gas models have 3/4 to 1½ h.p. for real SNAP! 125 miles up per gal. gas. Clutch, kick starter, etc. Write for literature and special prices. **MIDGET MOTORS CORP., Dept. M-5, Kearney, Nebr.**

GIVE ME 7 DAYS TO PROVE I CAN MAKE YOU A NEW MAN—


SEND FOR MY FREE BOOK

I changed **myself** from a 97-lb. weakling to winner of title, **"World's Most Perfectly Developed Man."** Let me prove—in 7 days—that my secret of **Dynamic Tension** will make a NEW MAN of YOU—give you glowing health, smashing strength—banish constipation, bad breath, pimples. Thousands praise my natural method. Write for FREE BOOK of actual photos. CHARLES ATLAS, Dept. 65, 115 E. 23rd St., N. Y. City.

Diesel

For several years, Diesel engines have been replacing steam and gasoline engines in power plants, motor trucks and busses, locomotives, ships, tractors, dredges, pumps, etc. And now the first Diesel-powered passenger car is on the market. Our home-study course offers you a real opportunity to prepare for a worth-while position in this new field. Write TODAY for full information. No obligation
American School, Dpt. D-528, Drexel at 58th, Chicago

LEARN EARN

YOU LET US! TEACH YOU AT HOME

NEW COURSE **SIGNS** SHOW CARDS EASY TO LEARN

POSTER AND ALL FREEHAND LETTERING

Write Dept. A
REGINA SCHOOL OF LETTERING
77 W. Washington St., Chicago, Ill.

PLASTEX

The Plastex Industry needs manufacturers on small scale and for big production of Art Goods, Novelties, Souvenirs, etc., in Plastex and Marble Imitation. Experience unnecessary. Equipment and simple instructions furnished for speed production. Small investment brings big returns. Nation-wide demand for these low priced goods. Ambitious men have chance for real prosperity. Our free book will interest and benefit you. Big wholesale season now starting. **PLASTEX INDUSTRIES, Dept. 3. 1085 Washington Ave., New York, N. Y.**

NO JOKE TO BE DEAF

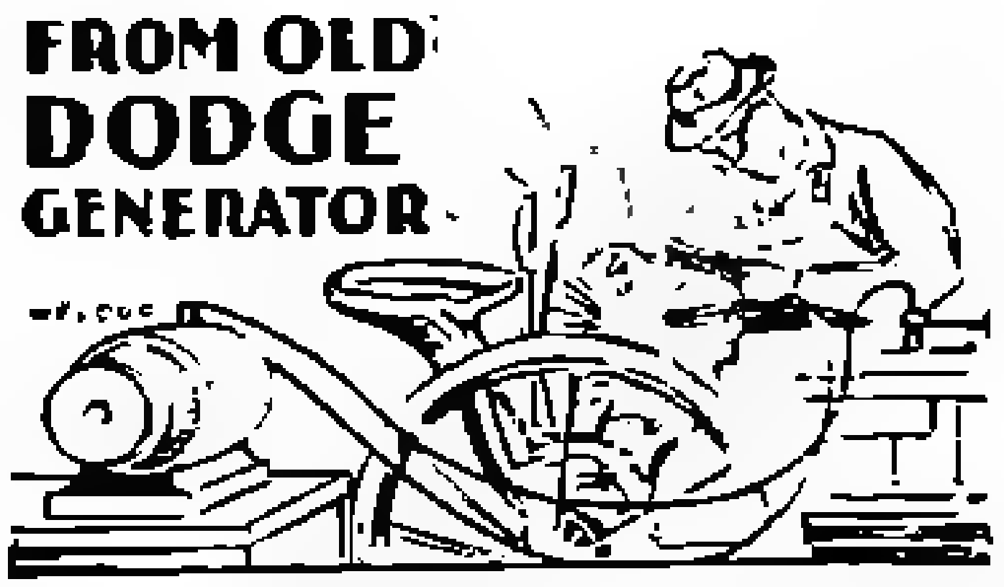
—Every deaf person knows that—

Mr. Way made himself hear his watch tick after being deaf for twenty-five years, with his Artificial Ear Drums. He wore them day and night. They stopped his head noises. They are invisible and comfortable, no wires or batteries. Write for TRUE STORY. Also booklet on Deafness.

Artificial Ear Drum

THE WAY COMPANY
741 McKerchey Bldg. Detroit, Michigan

BUILD ARC WELDER FROM OLD DODGE GENERATOR



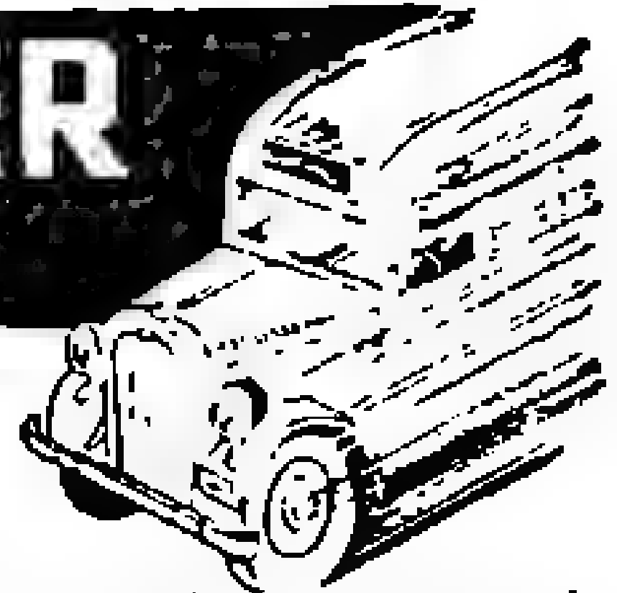
"We Show You How"

For Light or Heavy Work

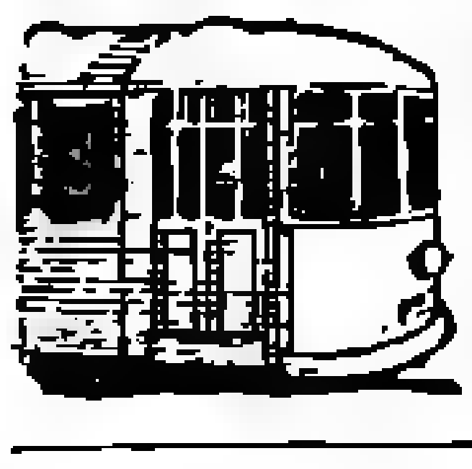
35c brings complete plans for building economical and efficient 75 to 200 amp. arc welder, and 1938 catalog listing over 500 welding and windcharger electrical items. Over 100 other generator changes into motors, generators, grinders, drill press and electric fence for operating on 6, 12, 32 or 110 volts.

LEJAY MFG. CO., 314 LeJay Bldg., Minneapolis, Minn.

BE A PASSENGER Traffic Inspector

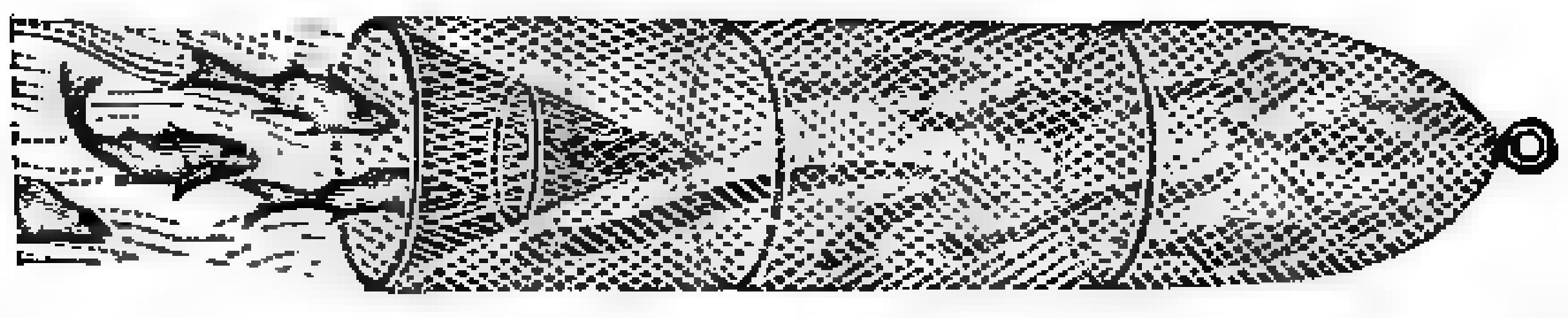


AMBITIOUS MEN . . Make Your Future Secure



Specialize as trained *Railway and Bus Passenger Traffic Inspector* and a position is ready for you. Our graduates are in constant demand. Short, home-study course qualifies you, and upon completion we place you at up to $135 per month, plus expenses, to start, *or refund tuition.* Advance rapidly with experience. Men—19 to 50 eligible. Free Booklet. **STANDARD BUSINESS TRAINING INSTITUTE, Div. 6105, Buffalo, N. Y.**

SURE LURE
FISH BAIT



Catch Fish!

Minnows. Eels. Mink. Muskrats, etc., in large numbers with our Folding Galvanized STEEL-WIRE TRAPS. They catch them like a fly-trap catches flies. Write for our FREE TRAP OFFER, bargain catalog and other specialties. SURE LURE, makes 'em bite day or night. New principle used. It coaxes fish. Put up in tubes 5 inches. Price 30c. 4 tubes for $1.
Walton Supply Co., 3501 A-Juniata St., St. Louis, Mo.

Italy Surpasses America In Establishing Air Records

Aviation records mean dollars in the value of airplane exports. It is more than coincidence that during the last two years, when the United States led the world in the number of aviation records held, aeronautical exports reached an all-time high, says Charles F. Horner, president of the National Aeronautic Association in Washington.

The sad part comes because now Italy has replaced America as leading world record holder. Last year the aviation record situation looked like this:

United States	54 records
France	37 records
Italy	26 records
Germany	8 records
Great Britain	1 record
Russia	1 record

Now, however, the aviation "batting averages" of the world have shown significant changes, and look like this:

Italy	45 records
United States	43 records
France	25 records
Russia	15 records
Germany	14 records
Great Britain	4 records

Fully as dramatic as Italy's climb from third to first in the record ratings is the rise of Russia from one record to 15 records within a single year, states Mr. Horner.

A feature of the records race has been the battle between Italy and Great Britain for the world's altitude mark. Since last summer first Italy and then Great Britain have alternated in pushing the mark higher, each time by approximately 2,000 feet. It is now held by Great Britain at 53,937 feet.

Problems

[*Continued from page* 18]

been unable as yet to suggest any royal road to boat building.

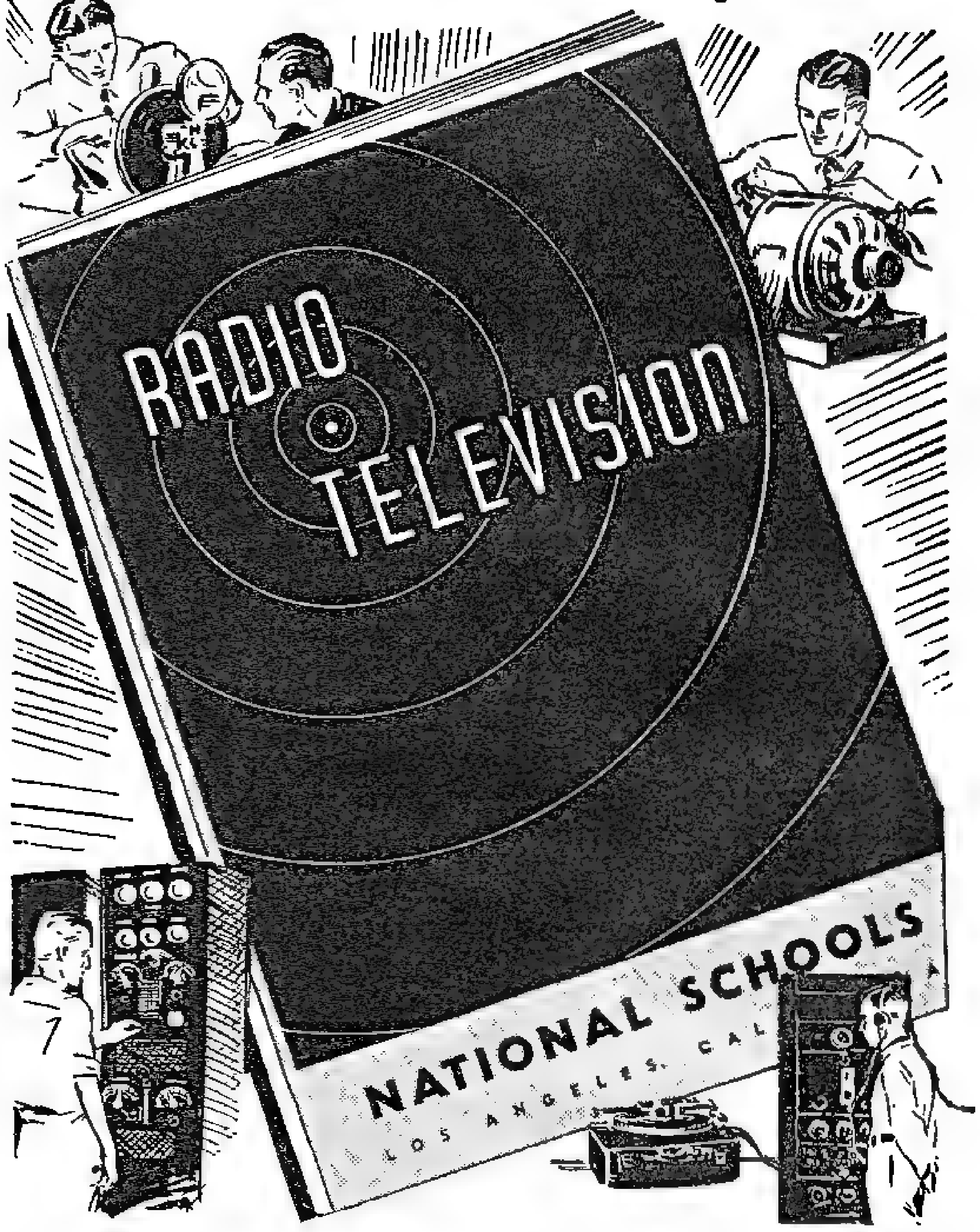
The editors cannot pass on the merits or marketability of an invention. These are problems the inventor should take up with his patent attorney. Many would-be inventors have an idea for a new device and write to us asking if this has been patented. This question is one for a patent attorney who will give an answer after a search has been made, if this is necessary.

Some readers do not consider the fact that when thousands of letters are received a month, the time available for answering each letter naturally is limited to a reasonable amount. Some letters received contain twenty to thirty questions, each one of which would require 500- to 2,000-word answers. Those letters can be answered only by referring the writer to standard reference books available in most public libraries.

MM editors have a sincere desire to help readers in their problems, but they can do so only with the help of the reader himself.

—THE EDITORS.

Do you like RADIO? Does the future of TELEVISION Interest You?



Send for your FREE COPY of this book of FACTS

Full of Instructive Information on Employment Opportunities and Requirements

You men who are sincerely ambitious to make good in radio and related industries will want a copy of this new book about employment opportunities and requirements. Written in plain, understandable language with no exaggerations and no mis-statements, this free book gives you facts you want to know about these profitable trades. 95 illustrations. Major subjects include Television Theory and Construction, Pick-up Systems, Amplifiers, Transmitters, Receivers, Cathode Tubes, Sound-Recording on disc, Loud Speakers, Talking Picture Projection and Radio Communication.

NATIONAL SCHOOLS is the oldest trade institution in the West. Established in 1905. Occupies its own modern three-story building, exclusively devoted to training ambitious men. Latest equipment. Selected, experienced staff of engineers and instructors. Many students can earn room and board while learning. National students are allowed coach railroad fare from any point in the United States.

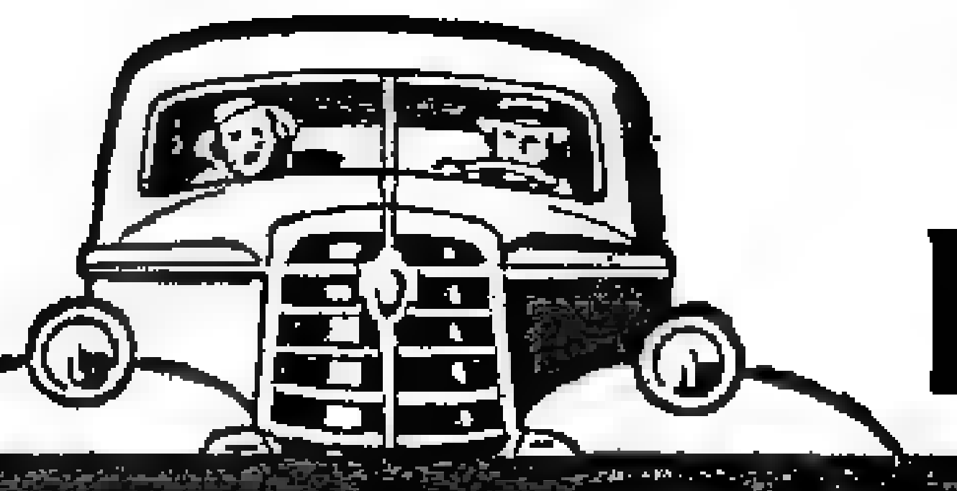
NATIONAL SCHOOLS
Los Angeles

Request for FREE BOOK of Details

NATIONAL SCHOOLS
Dept. MMR-5 4000 So. Figueroa Street, Los Angeles, Calif.

NAME .... AGE ....
ADDRESS ....
CITY .... STATE ....

SIX BIG AUTO BOOKS



Shipped FREE

on approval. Get a better job in the gigantic automobile industry. Make yourself an expert quickly with the help of these amazing automobile books, 19th edition, chock full of vital automobile information. Put your finger on what you want to know without long search or study. The Jiffy Index (exclusive in these books) makes them an instant reference library. Take advantage of our great offer to ship them to you FREE for examination.

Repair Any Auto Fault

No matter how difficult a repair job may seem to be you can find the answer in these books which cover fully automobile operation, construction and repair. Best of all, they are right up to the minute with all the latest gadgets, appliances and improvements covered. 2500 pages—2000 illustrations and wiring diagrams, together with articles on marine engines, aviation motors, diesel engines, tractors, etc., making this the most complete automobile cyclopedia ever published. There are 6 great big volumes in this brand new edition. Covers are flexible leatherette, gold stamped.

In addition to these books, if you send now, we will include a membership for one year in the American Technical Society, which entitles you to free consultation privileges with our automobile experts.

Fit Yourself for Bigger Pay

Send the coupon now with your name and address only, (don't send money).

AMERICAN TECHNICAL SOCIETY
Drexel Ave. at 58th St. Dept. A5320, Chicago, Illinois

I would like to see the new 6-volume edition of your AUTO BOOKS. I will pay the few cents delivery charges only, but if I choose, I may return them express collect. If after 10 days use I prefer to keep them, I will send you $2 and pay the balance at the rate of only $3 a month, until $24.80 is paid. Please include free consulting membership as per your offer above.

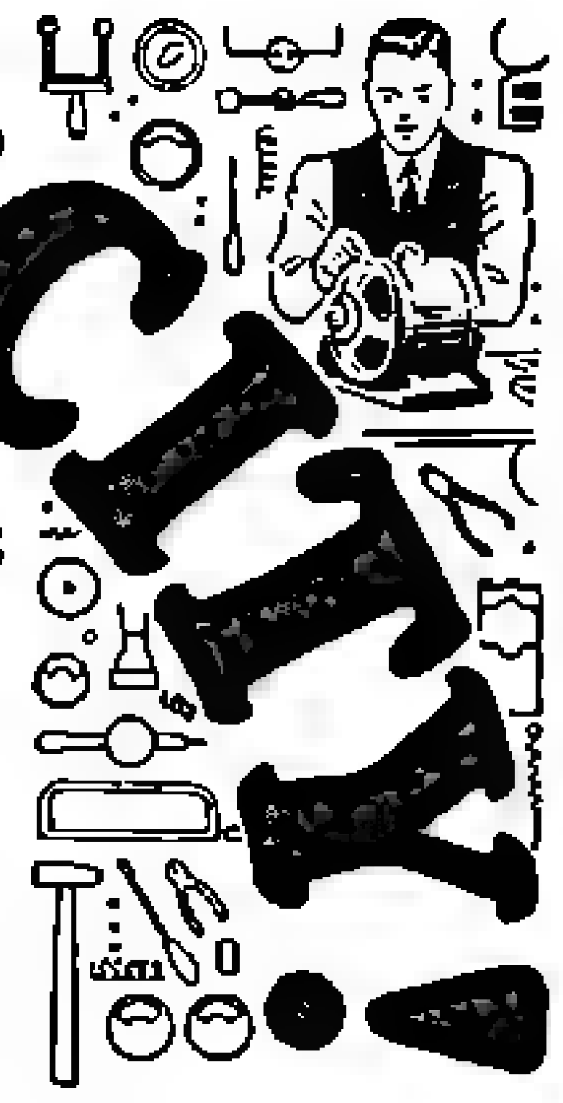
Name.... ....

Address........ . ...

City..State......................

Attach letter stating age, occupation and name and address of employer and that of at least one business man as reference.

ELECTRICITY!



RADIO··REFRIGERATION··
DIESEL ELECTRIC POWER

Learn Quickly-in Spare Time at Home
-by Practical Shop Methods

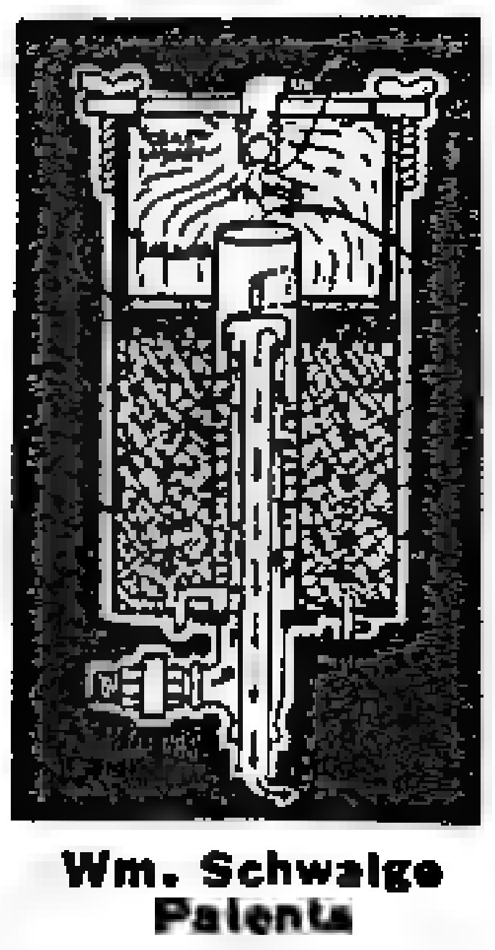
New easy way to prepare for jobs leading to salaries of $30, $40, $50 a week. Opportunities to earn $5—$10 a week and more while training. Learn by doing actual jobs in your own home electrical shop. Electrical Equipment and Apparatus supplied at no extra cost to make training practical. No previous experience or advanced education necessary. Money back if not satisfied. Write for FREE BOOK of Facts and Opportunities for you as a **trained Electrical Man.**

ELECTRIC INSTITUTE **H. W. PETERSEN, President**
Dept. 48E **Hinsdale, Illinois**

NAME______________________AGE________

STREET____________________________

CITY____________________STATE________



Wm. Schwalge Patents

90 DAYS FREE TRIAL

"OIL DOES NOT WEAR OUT"

(U. S. BUREAU OF STANDARD—BUL. 86)

THEN WHY CHANGE OIL?—Because ordinary oil filters remove solids only and none of the other destructive foreign matter.

RECLAIMO—The Super Filter-Refiner not only removes solids, but also evaporates gasoline dilution, water, corrosive acids thru the use of exhaust heat—KEEPING the oil **CLEAN** and **OILY Indefinitely!** Attached to Autos, Trucks, Tractors and Diesels in place of now obsolete oil filters, **RECLAIMO** MAKES OIL CHANGING A THING OF THE PAST. Add oil only to maintain level.

Thousands of **ENTHUSIASTIC OWNERS**

Read some of their remarkable statements in our **FREE Booklet "Oil Facts"—tells you plenty about** oil and may save you a lot of money—sent **FREE** with **90-Day Trial Offer.** Write today.

RECLAIMO MFG. CO., Dept. N, 2306 N. Western Ave., Chicago

NEW, BIG, FULL SIZE ADDING MACHINE

Only $9.95 COMPLETE!

Amazing invention! Sensational Add-O-Matic Adding Machine retails at only $9.95 complete. Adds, multiplies, subtracts, divides. Does everything the expensive machines do! A big, sturdy, well constructed machine for lifetime service. Needed by retailers, professional men, etc. for bookkeeping, taxes, checkbooks. Visible totals. Quick—easy—accurate.

AGENTS—biggest money maker in years! Take orders everywhere for first efficient, full size adding machine at **LOW PRICE.** Sells quick on simple demonstration.

ADD-O-MATIC CO.
Dept. B-10, 430 N. Oakley Blvd., Chicago, Ill.

NEED MONEY?

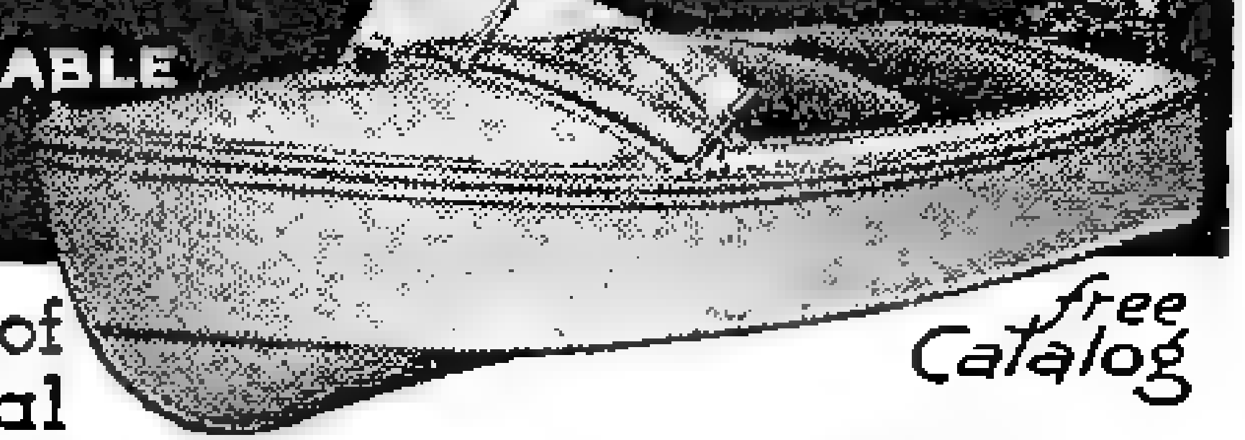
Write for free booklet describing "107 Plans for Operating a Successful Business of Your Own". Make from $20 to $100 a week starting in spare time at home. No peddling or house-to-house selling. Booklet sent *free*, and *without obligation.* Write for your copy *today.*

ELITE PUBLISHING CO.
Dept. G 214 Grand St. New York, N. Y.

FREE BOOK

STAR METAL BOATS

NON-SINKABLE
CARE-FREE
ECONOMICAL



A complete line of well-built metal rowboats, outboard motor boats, and sailboats. Save money—get better quality at lower prices.
STAR TANK & BOAT CO. Dept. M—Goshen, Ind.

MAN IN EACH TOWN

To Plate Auto Parts

Reflectors, Bicycles, Fixtures, Mirrors, by late method. Simple plan of manufacturing at home starts you IN GOOD PAYING BUSINESS. Write today for FREE particulars and proofs.

GUNMETAL CO.,
Ave. P, Decatur, Ill.

PANDICULATE FOR HEALTH

BE WELL, STRONG, YOUTHFUL

BOOKLET FREE

Enjoy the vigor that comes from relieving pressure on spinal nerves. 15 glorious minutes on Pandiculator gives pep like full gymnasium workout. Hundreds of hospitals, sanitariums and doctors use this great spinal corrective appliance. Send for FREE booklet.
PANDICULATOR CO. 416 Newman Stern Bldg., Cleveland, O.

HOME WORKSHOP FANS

Get full advantage from your shop by building that project you have long had in mind. No doubt you'll find it explained fully in the 1938 *How-To-Build-It* book which contains plans for making midget racers, auto trailers, furniture, radios, games and toys. Send your 50c now for this big 148-page book—contains 500 pictures and plans all in rotogravure.

MODERN MECHANIX PUBLISHING CO.
Fawcett Bldg. Greenwich, Conn.

New De-Icer Uses Engine Heat To Warm Plane's Wing

Ice formation on airplane wings—that bug-a-boo of pilots—may be prevented by a simple and efficient system utilizing waste heat from the exhaust pipe of the airplane's engines, it is revealed in a patent (No. 2,081,963) recently granted to two National Advisory Committee for Aeronautics engineers.

The inventors of the new "ice preventer" are Dr. Theodore Theodorsen of Hampton, and William C. Clay of Buckroe Beach, Va.

Readily installed in airplanes of any type—biplanes, low and high wing monoplanes—the system utilizes vapor heat by projecting it against the leading edges of the wings where ice generally forms. The heat warms the wings, and prevents ice formation.

The vapor heat is produced in a boiler or tank which is built around the engine exhaust pipe. The waste, hot exhaust gases passing through the exhaust pipe, transfer their heat to the water in the boiler and vaporize it. The hot vapor travels through a pipe into a long, perforated, distributor pipe which lies inside the wing adjacent to its front edge. Out of the perforations the heated vapor shoots in a series of jets against the leading edge of the wing. The hot-water vapor keeps the wings warm.

The condensed vapor flows into pockets inside the wing, where it drains down pipes back into the boiler. It is again converted into hot-water vapor by the hot exhaust gases. Thus the ice-preventing system is a continuous one.

To prevent the returning condensed water from freezing, a portion of the return pipe passes through the main pipe along which the hot vapors are passing to the wings.

Another feature of the ice preventer is the inclusion of rain slots in the wings for collecting moisture flowing rearwardly from the heated parts of the wings. These collect and dump the moisture to prevent it from reaching the unheated rear surfaces of the wings where it would freeze.

Installation of the ice preventer, say the inventors, does not disturb the balance or stability of the airplane.

New Use For Old 'Squeegees'

SQUEEGEE plates which have become too dull for further use, can be converted into serviceable developing trays for processing large prints. Bend up the sides and ends of the plates so that the tray attains a depth of about 1½ inches. Do not cut the corners of the metal, but rather fold them over to form a flat-type waterproof joint.

NOTICE

Changes in the make-up and title of this magazine will become effective with our next issue. Reserve your copy now. Our new name will be—"MECHANIX ILLUSTRATED."

STARVED HAIR ROOT
ACTIVE HAIR ROOT

Amazing Invention GROWS HAIR in Many Thousands of Cases

For many years hair and scalp specialists have known that inner stimulation of blood circulation in deep-lying scalp blood vessels stimulates growth of hair. Here is an amazing machine which, through principle of "Intermittent Vacuum," actually pumps blood to starved and stunted hair roots, stops falling hair, and results in new growth of hair. Yes, results are obtained even in many so-called hopeless cases of baldness.

Amazing Reports from Users

The Rand is simple to use. Hook up to any faucet — place helmet over head — turn on water — that's all! No water touches your head or you. Only power of water is used to create intermittent vacuum.

Results!

GUARANTEED TRIAL OFFER

You men who have tried everything else—you men who are losing your hair and are rapidly approaching embarrassing baldness—you men who have given up hope of ever regaining your hair—YOU are invited to try the Rand Hair Growing Machine on our amazing Guaranteed Offer. Stop being laughed at behind your back! Stop being called "Baldy"! Stop looking old before your time!

FILL OUT AND MAIL COUPON RIGHT *NOW!*

The illustrations above explain the Rand principle of growing hair. At left is a starved hair root—too weak to shoot hair through the scalp. At right is a strong, active hair root—GROWING HAIR—because it is properly nourished by rich blood supply.

NEW HAIR IN 90 DAYS!

The exact time it takes for the hair to appear varies with the individual case, but in many cases new hair appears in as little as 90 days. Usually hair stops falling out after first few treatments, scalp glows and tingles with new vigor due to stimulated circulation. Often results are quick and startling. You use the Rand at home, while resting or reading. Several 15 minute treatments per week are sufficient.

PRICE Only $9.95

SEND NO MONEY—YOU PAY ONLY IF SATISFIED

You may have spent hundreds of dollars to regain your hair. The Rand costs you only $9.95, complete, **but you pay this only if you are satisfied with results.** Send no money with coupon below. Pay postman small deposit of only $5.00 plus postage on arrival of the Rand. Then use it for 30 days according to directions. If you are then convinced that it is helping you, pay balance of only $4.95. Otherwise return the Rand to us for full refund. You risk nothing and you may again enjoy a thick, luxuriant growth of hair! Hurry—rush coupon below today.

RAND HAIR GROWER CO., Dept. H-1660, 402 E. 4th St., Newport, Ky.

Rush this Coupon SEND NO MONEY!

Rand Hair Grower Company, Dept. H-1660
402 East 4th St., Newport, Ky.

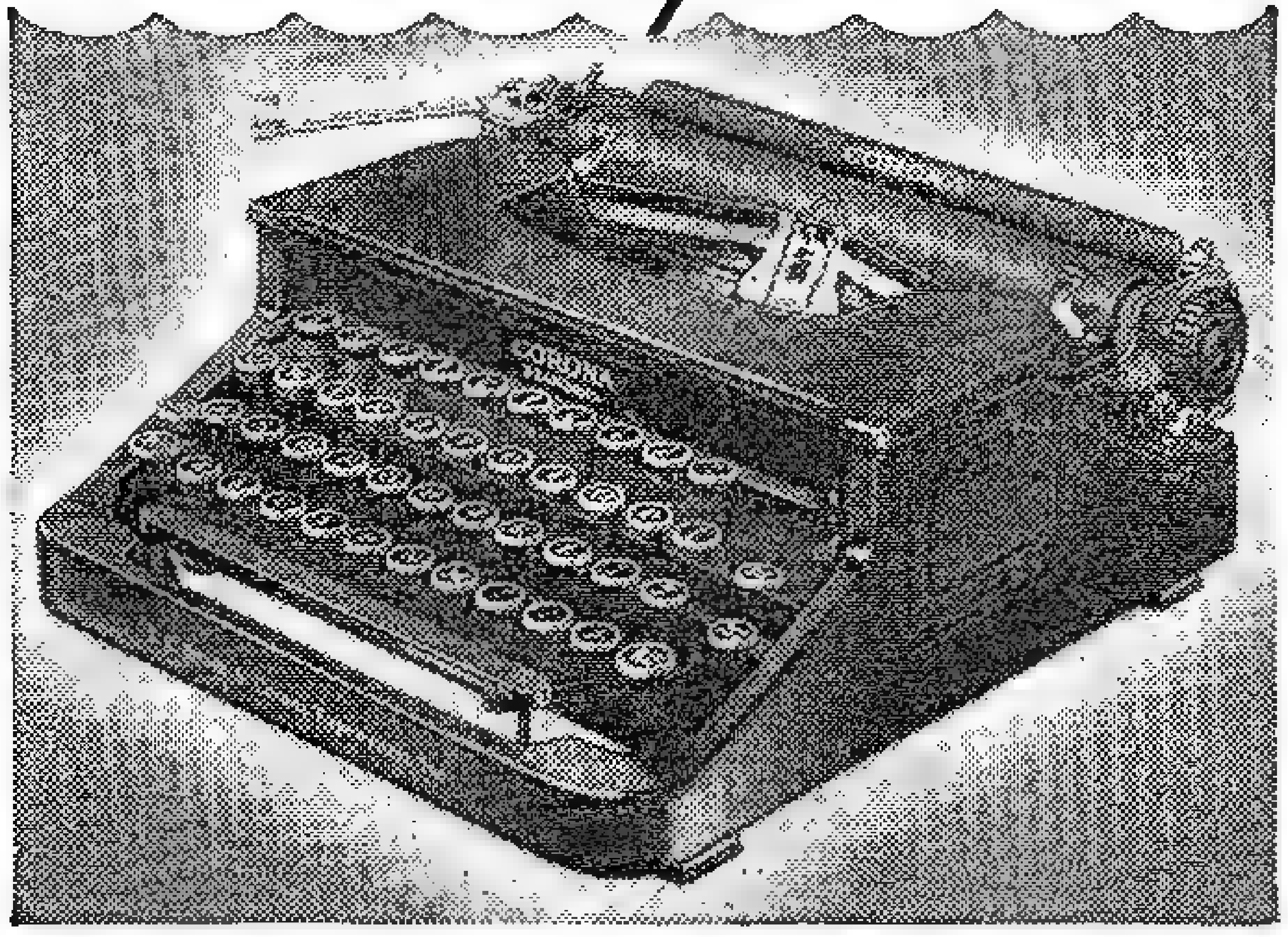
Please ship the Rand, complete, to me C.O.D. for $5.00 plus postage. I agree to pay balance of $4.95 if after 30 days, I am satisfied with results. Otherwise I may return the Rand to you and you will refund my money.

Name ....

Address ....

City.. State............

Floating Shift



ONLY CORONA HAS IT!

Ask any "big machine" typist if Floating Shift doesn't save work and wear, improve alignment, add speed! Then look at all the other Corona features . . . Touch Selector, Speed Booster, All-around Frame, etc. Match Corona against all comers. Easy to use . . . easy to pay for . . . as little as $1.00 a week. Free case and touch chart.

MAIL THIS COUPON!

L C SMITH & CORONA TYPEWRITERS INC., Desk 5,
733 E. Washington Street, Syracuse, N. Y.

I'm thinking of buying a Corona. Send free descriptive booklet and terms.

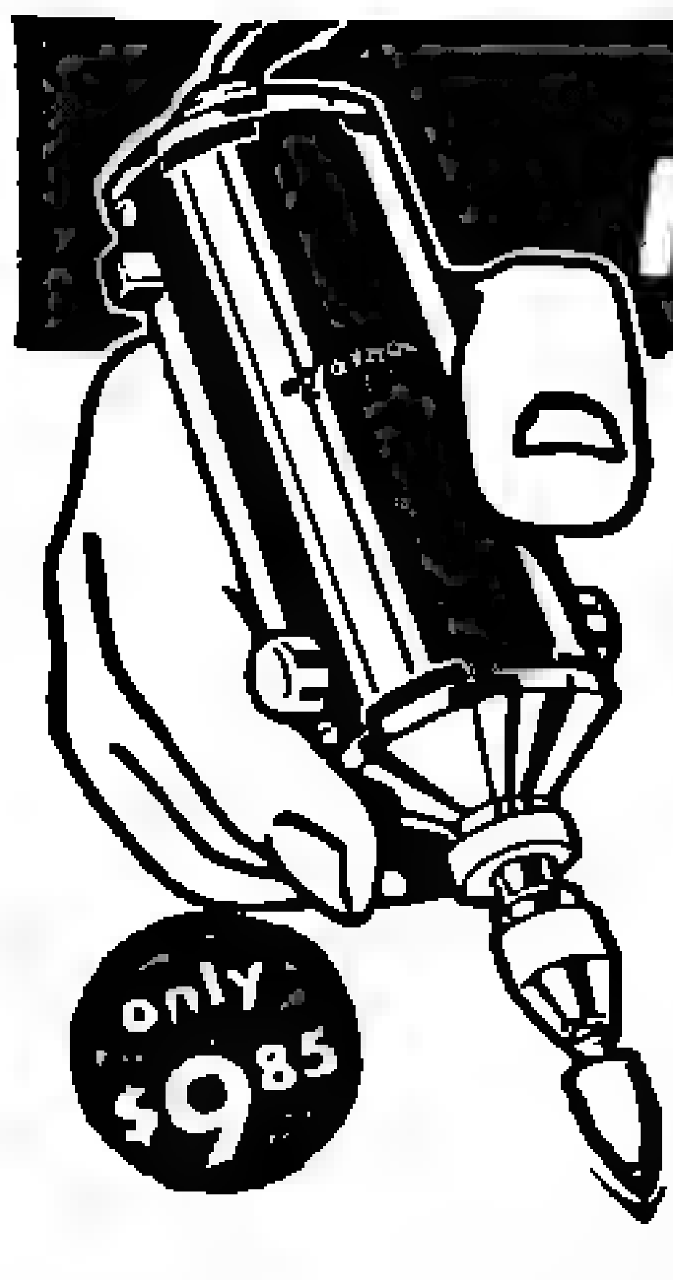
Name ________________

Address ________________

City ________ State ________

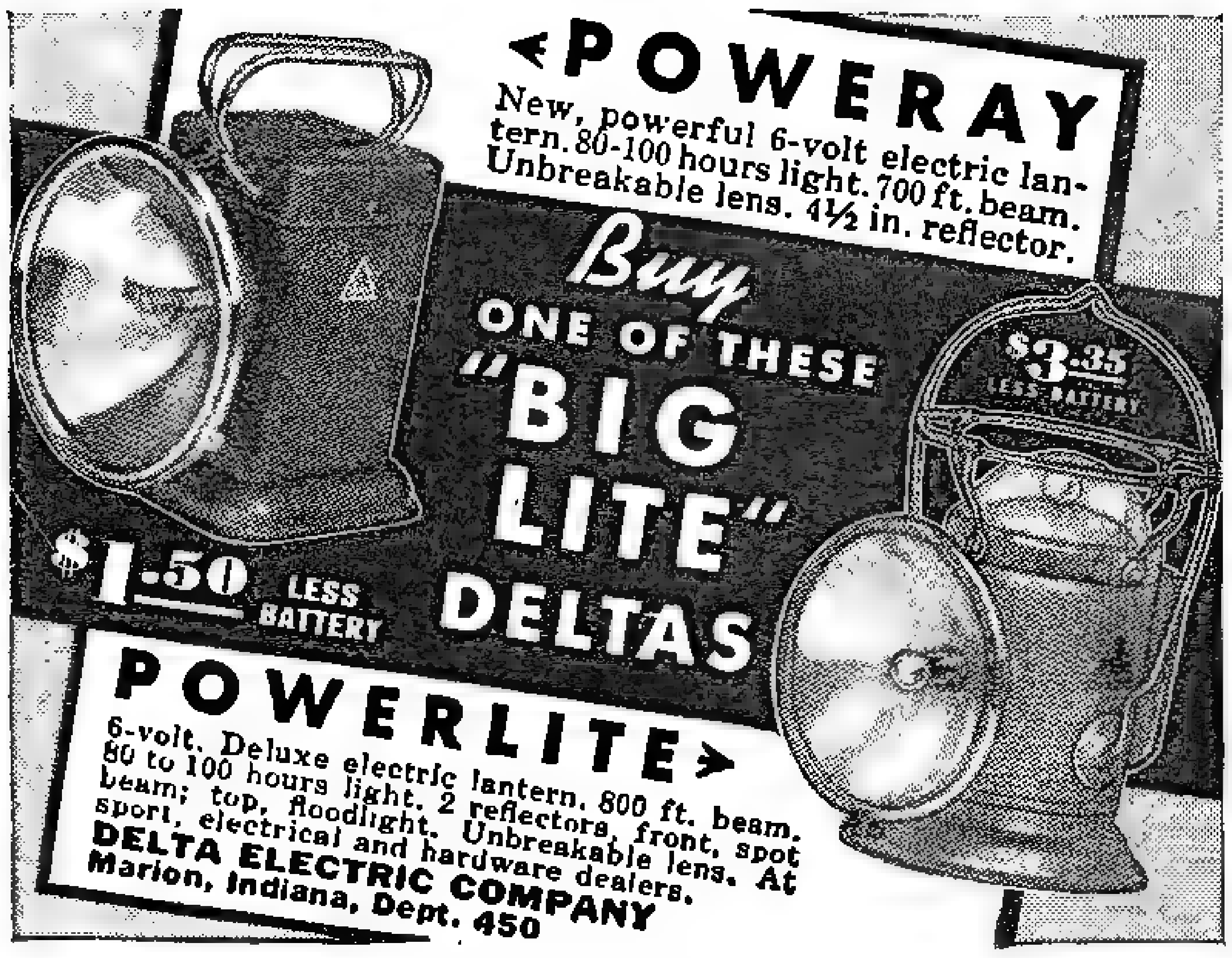
ALL-PURPOSE

MOTO-TOOL



Everyone who works with his hands—at home shop, school or profession—can use the efficient, attractive Moto-Tool to advantage. It grinds, drills, polishes, routs, carves, etc., on all materials. Chuck uses many tools. You do in seconds jobs that require hours of hard hand work. Plugs in any socket. Weighs 6 oz., about 20,000 r. p. m. Safe—thousands in use. Model 2 faster, heavier, more powerful, $16.50 postpaid. Give Moto-Tool a 10 day free trial under your conditions. Convince yourself that it is the best machine. Order machine. Order today—or send for free booklet.

DREMEL MANUFACTURING CO., 1029 CT, Racine, Wisconsin



POWERAY

New, powerful 6-volt electric lantern. 80-100 hours light. 700 ft. beam. Unbreakable lens. 4½ in. reflector.

Buy ONE OF THESE "BIG LITE" DELTAS

$1.50 LESS BATTERY

$3.35 LESS BATTERY

POWERLITE

6-volt. Deluxe electric lantern. 800 ft. beam. 80 to 100 hours light. 2 reflectors, front, spot beam; top, floodlight. Unbreakable lens. At sport, electrical and hardware dealers.

DELTA ELECTRIC COMPANY
Marion, Indiana, Dept. 450

FREE TRIAL LESSON

Free TRIAL LESSON IN • DRAFTING

More good jobs now in Drafting. Learn AT HOME in spare time (or at our Chicago School). Send post card for **FREE TRIAL LESSON** and see how easy to learn and get a good job.

CHICAGO TECHNICAL COLLEGE
E263 Tech. Bldg., 118 E. 26th St., Chicago, Ill.

If you can go away to college to learn Drafting, Engineering, Architecture, Electricity, Air Conditioning or Radio—send for FREE Blue Book.

Want a Career in photography?

We give you personalized training. *Commercial, News, Portrait, Advertising, Candid* or *Motion Picture* Photography. Big money-making opportunities. Or learn for pleasure. Personal Attendance and Home Study courses. 28th year. *Free booklet.*

NEW YORK INSTITUTE OF PHOTOGRAPHY
10 West 33 St., (Dept. 153) New York City

LEARN TO PLAY THE HAWAIIAN GUITAR

The Hawaiian way. Surprise and entertain your friends. Amazing new simple method makes learning to play from REGULAR PIANO MUSIC as fascinating as a game. Shows you in pictures how to do it. Previous musical training and talent unnecessary. Earn while learning by new plan. You pay for the lessons just as they are received. Write today for free information. A post-card will do. (Fine guitars supplied $5 up.)

25c PER LESSON

ACADEMY OF HAWAIIAN MUSIC
P. O. Box 163, Dept. B-5
MAYWOOD, ILLINOIS

WE HAVE *The* RADIO YOU WANT

How would you like to save up to 50% on Nationally advertised Radios, such as Stromberg Carlson, Philco, RCA, Zenith, G. E. etc., etc., for home, farm and auto; over 400 models to choose from. Also hundreds of electric appliance items for the home. Write today for the new 1938 giant catalog FREE.

MODELL'S Dept. 55. **Cortlandt St., N.Y.C.**

DUPLICATORS TYPEWRITERS ADDERS—FOLDERS ADDRESSOGRAPHS

SAVE HALF!

Write for Booklet and 10-Day Free Trial. Terms as Small as 10¢ A Day!

PRUITT CO., 902 Pruitt Bldg., Chicago

EARN BIG MONEY
BLENDING CHEESE *with* CORN

Make delicious new food sensation—Cheese Coated Pop-corn. Sell at wholesale to stores, taverns, restaurants, etc. We furnish complete outfit, including formula and instructions. Low priced. Start at home. Particulars free. Send name and get all the facts free.

CHEEZE-KIST COMPANY, 542 High Street, Springfield, Ohio.

ROOFLESS PLATES WITH THE 3 POINT SUCTION FEATURE!

Mouth Clear
NO ROOF
1
2
3

Featherweight—no gagging—Natural Taste—Holds Better. Singers, Speakers like the extra tongue room, clearer mouth. All forms false teeth—by mail—as low as $9.75. 60-day trial. Write for FREE catalog, impression material and sample. We trust you. Monthly payments.

HOD LABORATORY, 462 HOD WILLIAMS BLDG., TAMPA, FLA.

Tiny Ball Bearings, Size Of Pin Head, Produced

Tiny, precision ball bearings are now being manufactured in Switzerland. In overall size, including the ball race, they are no longer than the head of a pin. They can be substituted for jewel and plain bearings in all forms of clockwork, motors, delicate machines and sensitive measuring apparatus.

They are particularly useful for aviation instruments because they can withstand shock and vibration better than jewel bearings. Tests on the reduction of friction obtained have been made for comparison with jewel and plain bearing. The mean damping time for rotational motion in identical conditions was eight times longer than for plain bearings and 20 times longer than for tapered pivots. The ball bearings have an extremely low coefficient of friction so that only approximately the same force is required for starting as for running.

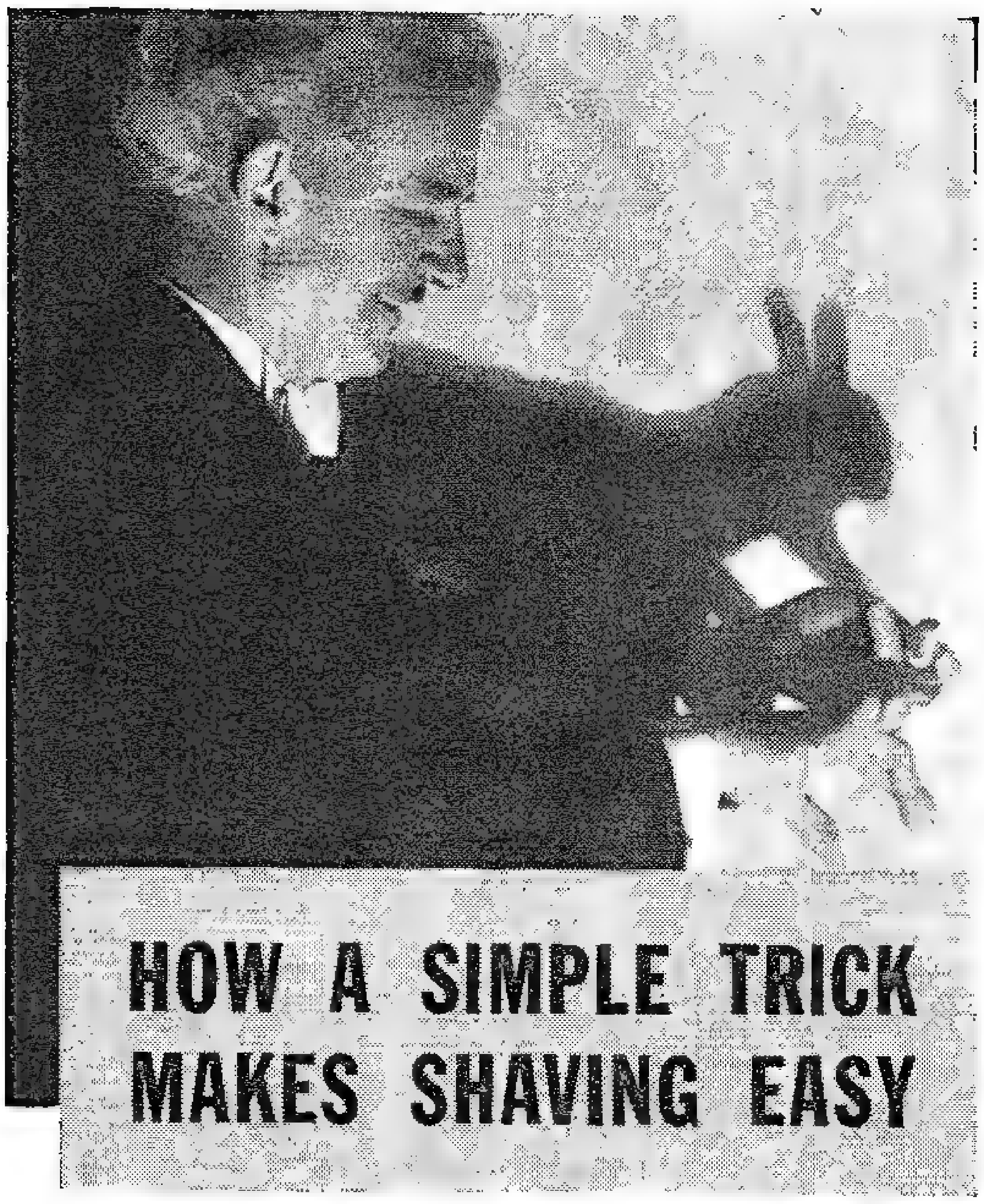
The smallest ball bearings now available (1.5 millimeter diameter) have three balls and the larger ones have eight. It is claimed they operate satisfactorily up to 10,000 revolutions a minute. Only 15 per cent as much oil is needed for lubrication as is required for plain bearings, so that they do not need lubrication for years in a small unit. The machined accuracy of the bearing is plus- or minus- 1/10,000 of an inch.

All-Welded Railroad Trains Predicted By Expert

The railroad car of the future will be largely assembled by gas, arc, and spot welding, V. R. Willoughby of the American Car and Foundry Company, New York, declared before a convention of the American Welding Society.

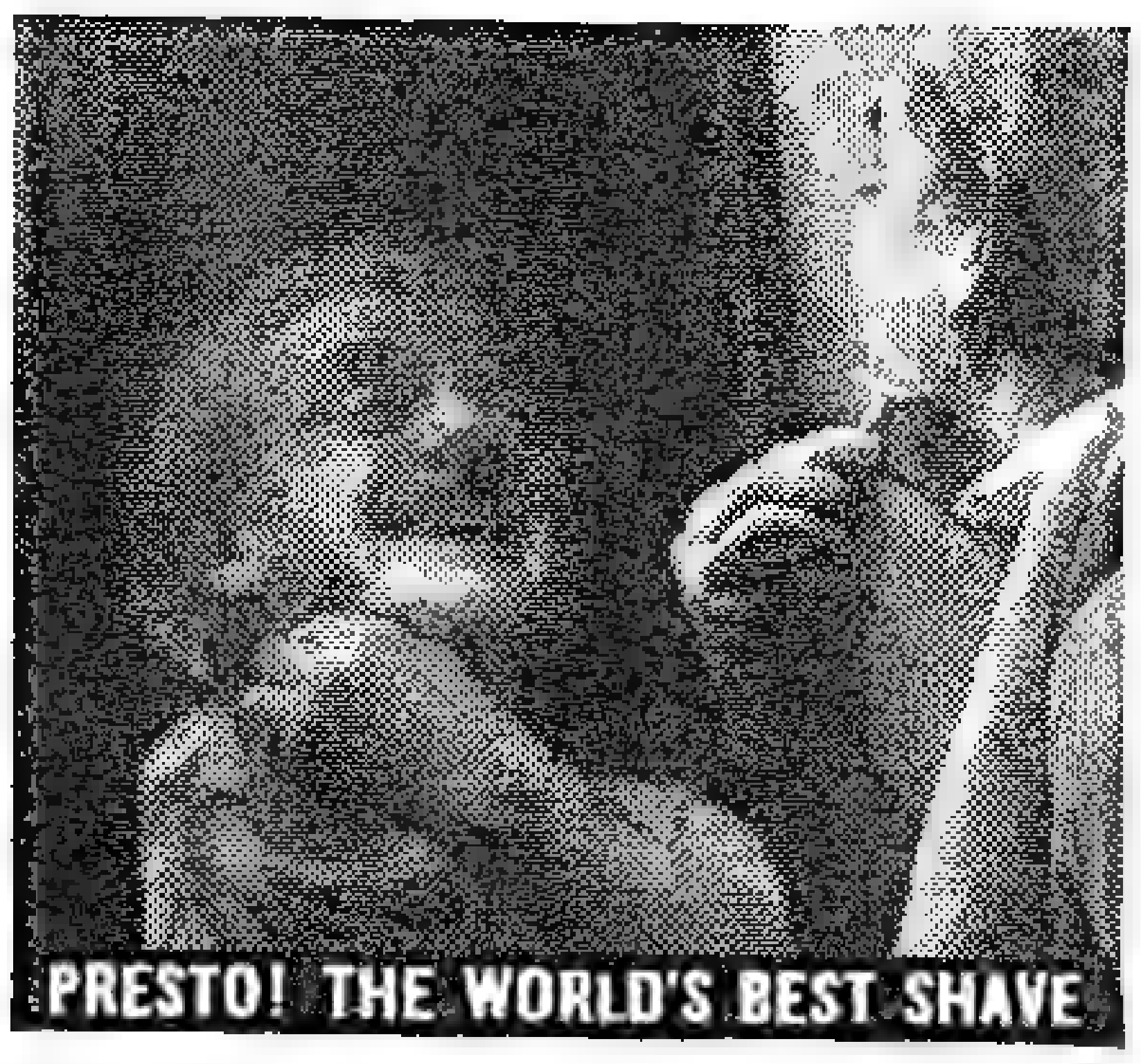
Welded freight cars can carry 2.7 per cent greater pay load than the lightest riveted design, "a difference which becomes highly significant when the mileage of the average car is considered," Mr. Willoughby pointed out. Welded 70-ton hopper cars already built weigh 45,900 pounds compared with 50,200 pounds for the riveted ones. The welded cars are able, therefore, to carry 164,100 pounds of pay load whereas the load-carrying capacity of the riveted car is only 159,800 pounds.

"Welded cars have behaved with entire satisfaction since 1930," Mr. Willoughby said. "Skillful designers make use of other advantages of welding. For example, the free discharge of cement from hopper cars practically requires the smooth interiors made possible by welding. Alloy steel and aluminum cars as well as tank cars for liquified gases have also been welded with entire success.



HOW A SIMPLE TRICK MAKES SHAVING EASY

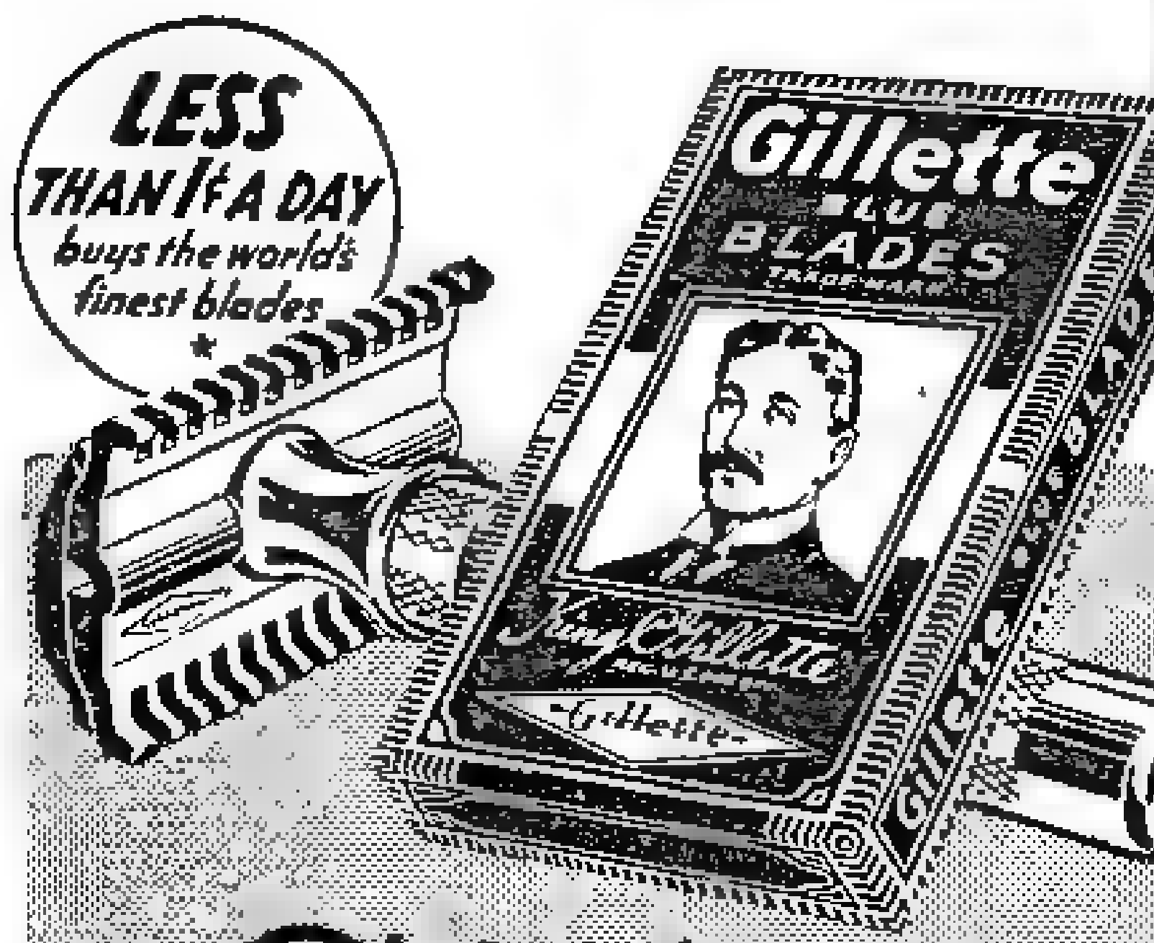
● Blackstone, master magician, says: "Making whiskers disappear like magic is one of the easiest tricks on earth. Just slip a Gillette Blade in your Gillette Razor and—presto—you've got the closest, longest-lasting shave money can buy. Shave the Gillette way and your face *shows* the difference—looks cleaner and smoother for hours!"



PRESTO! THE WORLD'S BEST SHAVE

● A few passes whisk away Blackstone's steel-gray stubble quickly and cleanly. You don't have to be a magician to duplicate this feat. Simply use a Gillette Blade in a Gillette Razor. You'll get the world's best shaves for *less than one cent a day.*

● Gillette Brushless Shaving Cream—made with peanut oil—softens tough whiskers, speeds shaving, soothes the skin. You'll like it! Big tube 25¢.



PRECISION-MADE FOR EACH OTHER

Gillette *Blades*

MORE SHAVING COMFORT FOR YOUR MONEY

High School at Home

Many Finish in 2 Years

Go as rapidly as your time and abilities permit. Equivalent to resident school work—prepares for entrance to college. Standard H. S. texts supplied. Diploma awarded. Credit for H. S. subjects already completed. *Single subjects if desired.* Bulletin on request.

20 Other Courses Specialized training is absolutely essential to Success today. Over 150 noted Educators, Engineers and Business Men helped prepare our special instruction material, used by many resident schools and colleges, U. S. Navy and Province of Manitoba, Can. Train at home for best-paying lines as listed below. No interference with present earnings while preparing for better job.

American School, Chicago

Mail Coupon for Information—No Obligation

American School, Dept. H-528, Drexel at 58th, Chicago
Tell me how to train for success in line checked.

☐ **High School Course in 2 Years**

- ☐ Air Conditioning
- ☐ Architecture and Building
- ☐ Automotive Engineering
- ☐ Aviation
- ☐ Business Management
- ☐ Civil Engineering
- ☐ Complete Law
- ☐ Diesel Engineering
- ☐ Drafting and Design
- ☐ Electrical Engineering
- ☐ Electrical Refrigeration
- ☐ Highway Engineering
- ☐ Liberal Arts (College)
- ☐ Mechanical Engineering
- ☐ Private Secretary
- ☐ Professional Accounting Incl. C. P. A. Coaching
- ☐ Radio and Television
- ☐ Salesmanship
- ☐ Steam Engineering

Name...
Address.......................................

Auto-Glide

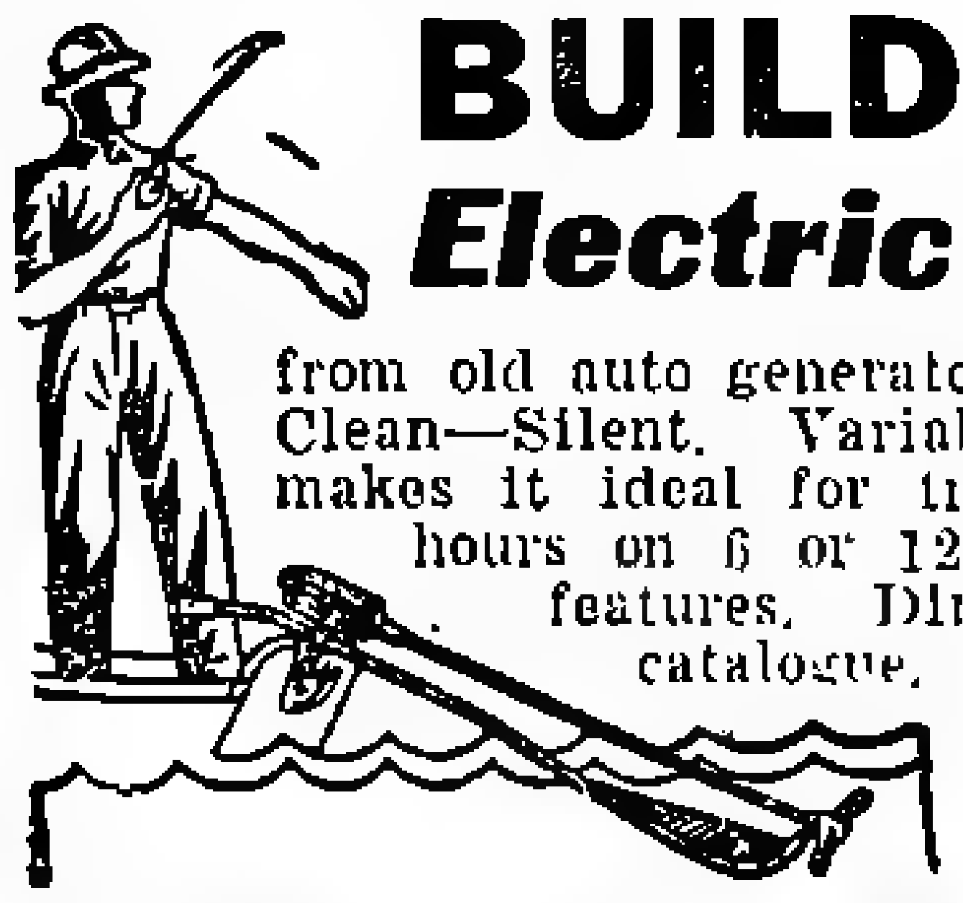
$125 and up FOB Fac'y

120 MILES PER GALLON

POWER—1½ or 2 H. P. Cushman engine. New 2-Speed Transmission—9-to-1 ratio in low! Climbs steepest hills, pulls Side-Kar with heavy load. Regular speed in high. ECONOMY--drug store has driven Auto-Glide 9,000 miles in 8 months for deliveries—3-gal. of gas a week—¼c a mile! RUGGED—one owner traveled 1,000 miles a month for 6 months, no replacements! 3 models: (1) Auto-Glide, illustrated (2) Karl-Pac, with parcel carrier, (3) 3-wheel Side-Kar model—carries extra passenger or 300 lb. load.

WRITE Send for free book, prices on new models. DEALERS: Write quick for Special Offer!

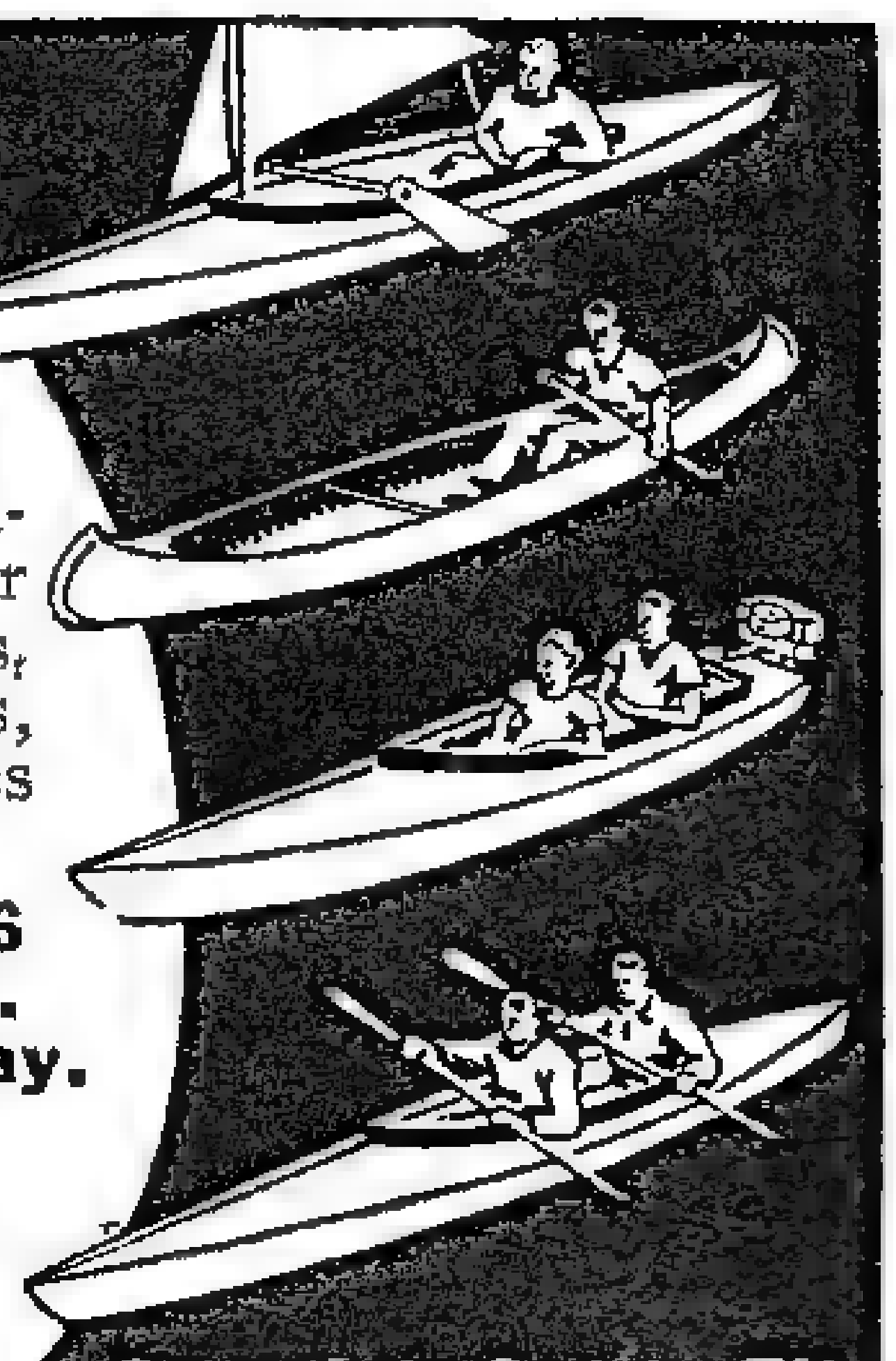
CUSHMAN MOTOR WORKS, Dept. R-5, Lincoln, Nebr.



BUILD YOUR OWN *Electric Outboard Motor*

from old auto generator. We show you how. Lightweight—Clean—Silent. Variable speed from standstill to maximum makes it ideal for trolling or casting. Operates 8 to 12 hours on 6 or 12 volt battery. Many other important features. Dime brings complete plans and valuable catalogue.

LeJAY MFG. CO.
514 LeJay Bldg.,
Minneapolis, Minn.



NEW CATALOG

LOW FACTORY PRICES

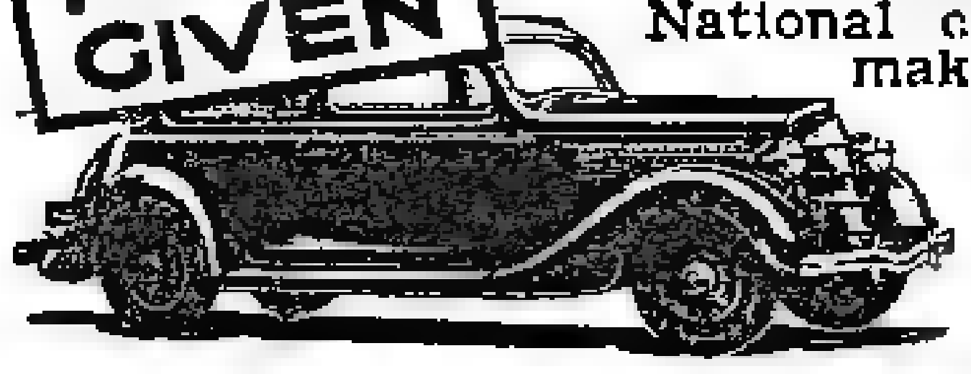
20 Kayak designs also assembling kits with instructions for home building. Aquaplanes, Outboards, Rowing Shells, Ice Yachts, Sailboats, Snipes & National one design.

SPECIAL GIFT OFFER, $6 DOUBLE PADDLE FREE. While they last. Write today.

SEND 10¢ for BIG CATALOG

KAYAK BOAT CO.
152 EAST 129 ST.
EW YORK, N. Y.

Complete Cut-to-Fit Assembling Kits



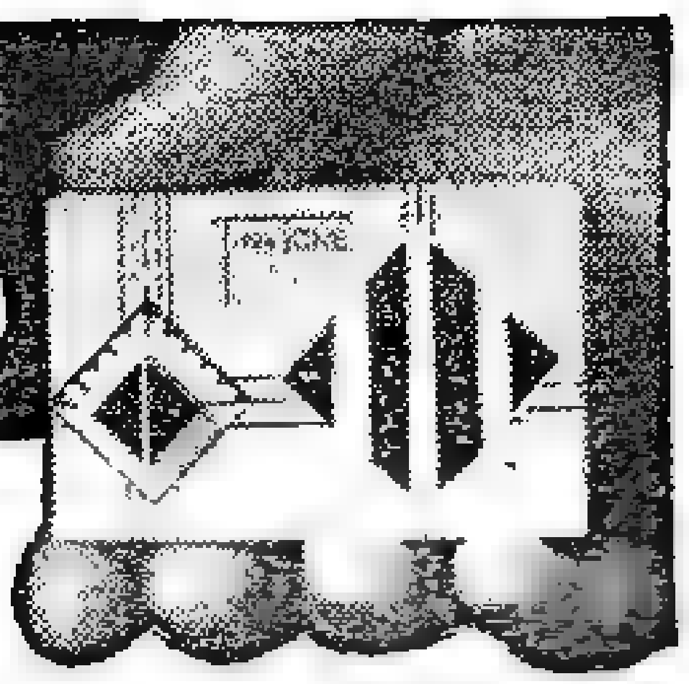
I WANT MEN

FORDS GIVEN

TEA AND COFFEE ROUTES PAYING UP TO $60.00 IN A WEEK

National company needs more men at once to make regular calls on local routes. No experience needed. Operate on our capital. I give producers brand-new Ford cars as bonus. Rush name on postcard for FREE facts.

ALBERT MILLS
5194 Monmouth, Cincinnati, Ohio



At Last! A WIRELESS TUBELESS BATTERYLESS Pocket Radio

WORLD'S SMALLEST REAL PERFORMING RADIO

Amazing midget radio weighs only 3 ozs. complete. Receives stations with clear beautiful tone. Should last for years. **ENTIRELY NEW DESIGN!** Not to be confused with cheaply made imitations. Mechanical Patent No. 2074887 covers complete construction. Music and programs **COME DIRECTLY FROM FRONT OF RADIO.** Has self-contained "Speakophone" which gives superior performance. **NOT A TOY.** The newest radio sensation of the year. Absolutely complete with instructions for use in homes, hotels, boats, etc. TAKES ONLY A SECOND TO CONNECT—no hookups to any current. SATISFIED OWNERS IN ALL PARTS OF THE WORLD report wonderful service. THESE ARE FACTS. Beautiful two color cabinets in six colors.

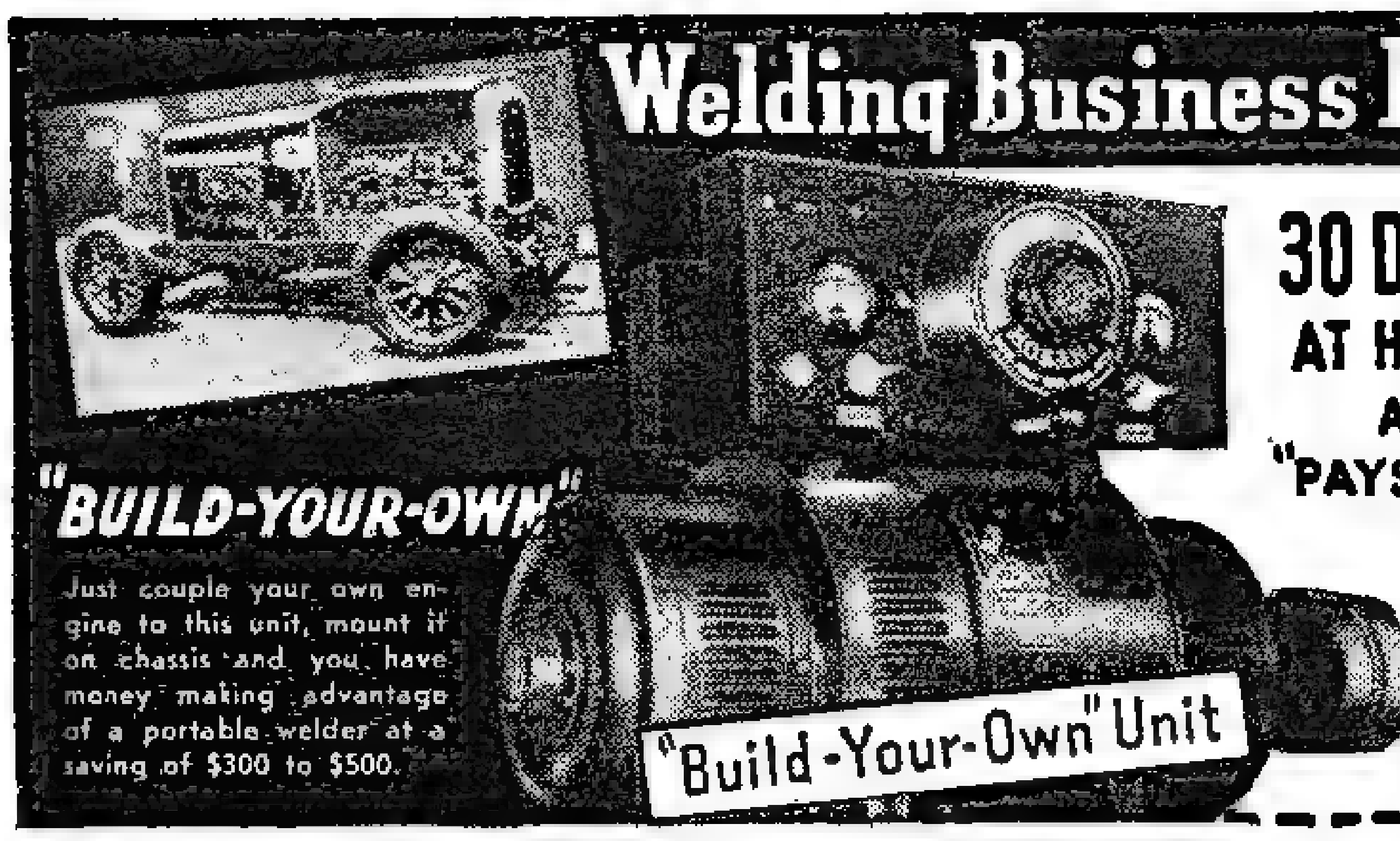
SEND NO MONEY Pay postman only $2.99 plus postage on arrival or send $2.99 (Check, M. O., Cash) and yours will be sent postpaid. GUARANTEED. Can be used by anyone. A most unusual value. ORDER NOW!

TINYTONE RADIO CORP. DEPT. M-5 Kearney, Nebr.

HAVE YOU SOME SPARE ROOM

a basement or garage where you can do light work? We can offer you a profitable proposition, casting 5 & 10¢ novelties, ashtrays, toy autos, etc. as Manufacturer for firm of many years standing. No experience necessary as we furnish full instructions with moulds. If interested in devoting spare or full time to profitable work write AT ONCE stating age and space available as we are now closing arrangements for 1938 supply of our goods.

METAL CAST PRODUCTS CO.
Dept. 2, 1696 Boston Road, New York, N. Y.



Welding Business Earns $150 to $300 for You Each Month

"BUILD-YOUR-OWN"

Just couple your own engine to this unit, mount it on chassis and you have money making advantage of a portable welder at a saving of $300 to $500.

"Build-Your-Own" Unit

30 DAY'S TRIAL AT HOBART'S RISK AND EASY "PAYS FOR ITSELF" TERMS

New low prices make this profitable welding service available to everyone. Opens doors to big pay jobs that carry real profit. Hobart Welders are easier to operate, faster, guaranteed to bring you quality welding business . . . extra profits will pay for welder without expense to you.

NO INVESTMENT TERMS—PROFITS PAY FOR IT

Extra earnings and savings possible with Hobart Welders make it easy to own without expense. You can even rent a new Hobart and later purchase it without loss. Coupon brings details.

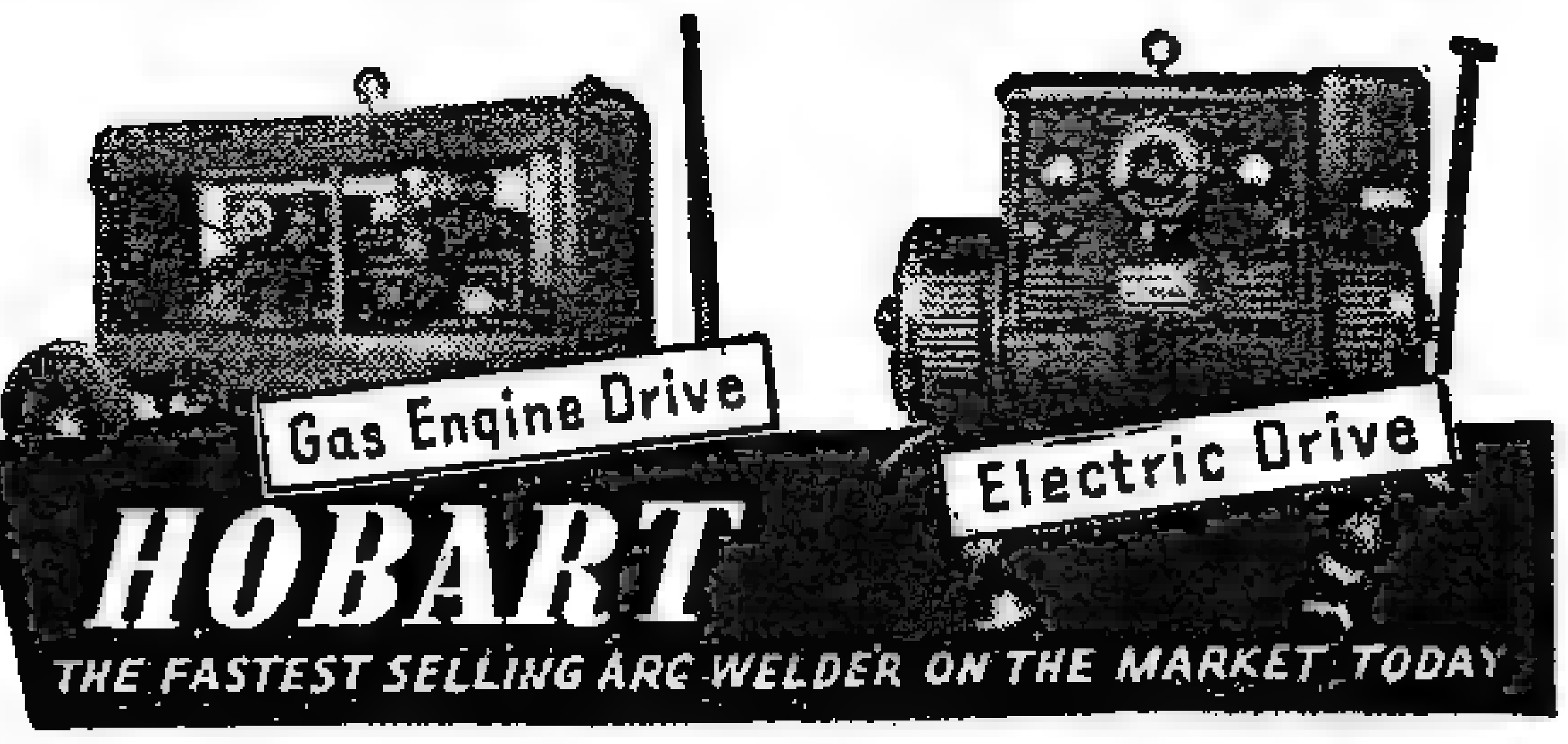
Free! VALUABLE BOOKLETS ON WELDING. CHECK YOURS AND MAIL THE COUPON TODAY.

- ☐ *How to "Build-Your-Own"*
- ☐ *New Profits in Arc Welding*
- ☐ *New Arc Welding Catalog*

HOBART BROS., BOX SM-58, TROY, OHIO

Gentlemen: Send me information on ( ) Build Your Own Welder ( ) Electric Drive Welder ( ) 30 Days Trial, Easy Terms ( ) Rental Plan. Also send me free books I've checked.

Name ....
Address ....



Probe New Matter Property

What may be an entirely new property of matter has been discovered in one of the world's rarest minerals known as "Hackmanite." Found originally in the rugged fiords of Greenland in the early years of the last century and later in the old crater of Italy's volcano Vesuvius, Hackmanite has long been a treasured collector's piece for scientific museums, for its rarity alone. Now a clear variation of the deep blue, lapis lazuli-like mineral may take on the added merit of research value.

Samuel G. Gordon, associate curator of minerals in the Academy of Natural Sciences here, explained the rare mineral and its new found property to Science Service.

The American mineralogist O. Ivan Lee of Jersey City, N. J., has made the strange discovery that a quickly passing red-violet colored streaking of the surface of Hackmanite can be revived at will by radiating the mineral with ultra-violet rays, explained Mr. Gordon.

For many years, continued Mr. Gordon, mineralogists have known that when a clear variety of Hackmanite was fractured, characteristic and beautiful bright red-violet splashes of color appeared on the clean surface. Then, on exposure to ordinary light, they passed away.

Radiation with ultra-violet light, Mr. Lee has found, brings back the lost property at will and as many times as one wanted to perform the experiment.

The first thing which one might think of to explain this strange revival of a color-death would be fluorescence, at least in the ordinary sense of the term, he added.

The flourescence of Hackmanite, that is its brief temporary glowing following exposure to light, is a characteristic salmon pink that cannot possibly be confused with the bright red-violet shade of the revived colors.

Neither is the happening one of phosphorescence since this property of Hackmanite yields a beautiful blue color.

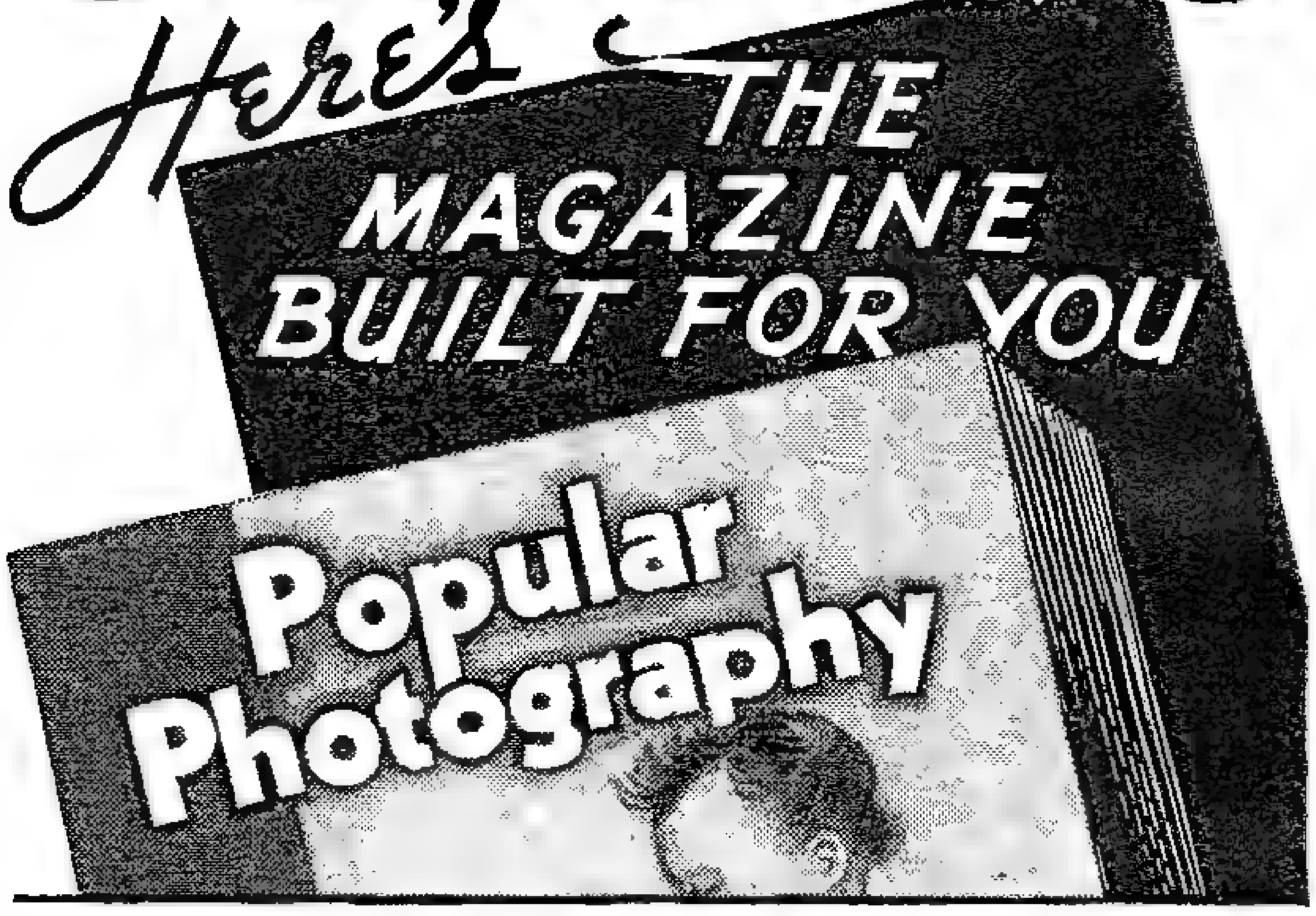
What really is the true explanation of the effect is thus unknown at present but at this stage of scientific research when supposedly the external properties of matter, at least, are well known, the discovery takes on added interest. Mr. Lee calls the phenomenon reversible photosensitivity.

A list of addresses of manufacturers of items mentioned in MODERN MECHANIX will be sent to any reader upon receipt of a stamped, return envelope.

NOTICE

Changes in the make-up and title of this magazine will become effective with our next issue. Reserve your copy now. Our new name will be—"MECHANIX ILLUSTRATED."

CAMERA OWNERS


Here's THE MAGAZINE BUILT FOR YOU
Popular Photography

. . . POPULAR PHOTOGRAPHY the most outstanding photographic magazine on the market today! . . . From cover to cover it's crammed with brilliant pictures, valuable information on all phases of photography, and interesting illustrated features and articles for everyone who owns a camera or likes pictures

In the **BIG** *Anniversary Issue {May}*

- **IVAN DMITRI** . . . the world's outstanding user of Kodachrome gives you detailed information on how YOU can take thrilling natural color pictures. **Illustrated with a 4-page color insert.**
- **DIRECTORY** . . . a complete review of the world's most popular cameras and accessories NEVER BEFORE PUBLISHED!
- **LENSES and DIAPHRAGMS**... the "Radio City Music Hall Corps de Ballet" cooperated with Jack Price in producing a series of brilliant illustrations to demonstrate the subject of "depth of field"
- **FILM CHART** . . . a handy reference table of data on all commonly used films.

ACT NOW . . . SAVE ONE-THIRD!

Take Advantage of our

SPECIAL OFFER
6 BIG ISSUES FOR $1

POPULAR PHOTOGRAPHY
608 S. Dearborn Street • Chicago

Enclosed find $1.00. Enter my subscription for the special introductory offer of 6 issues for $1.00.

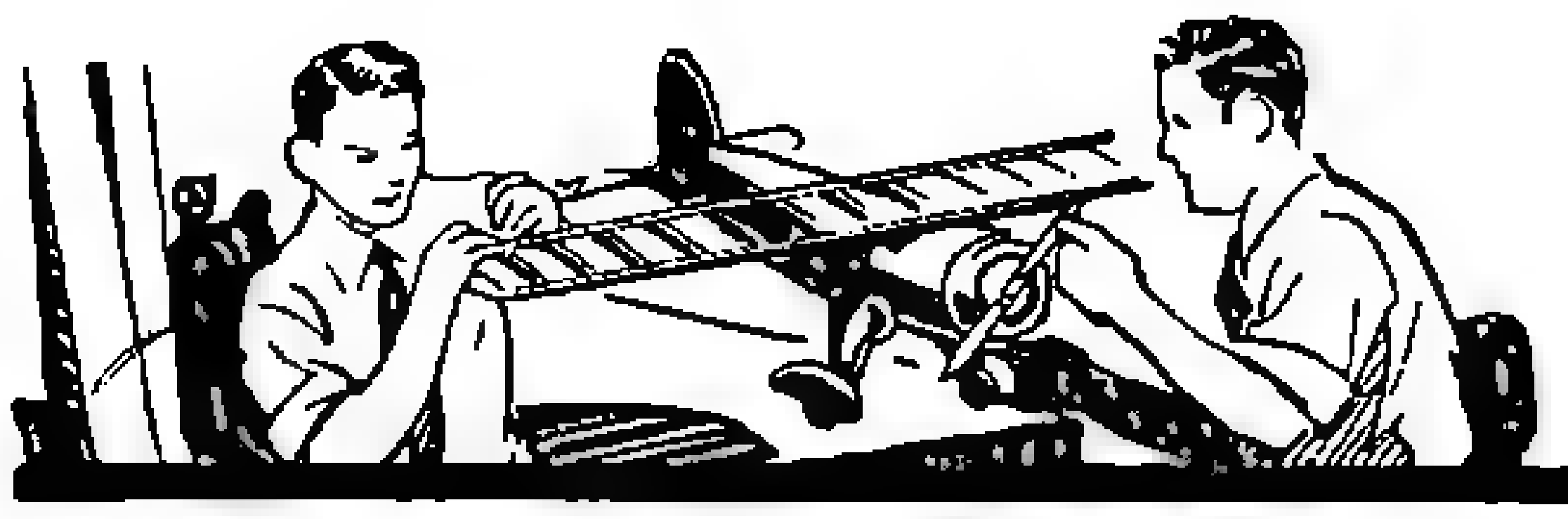
Start my subscription with the__________issue.

Name ____________________

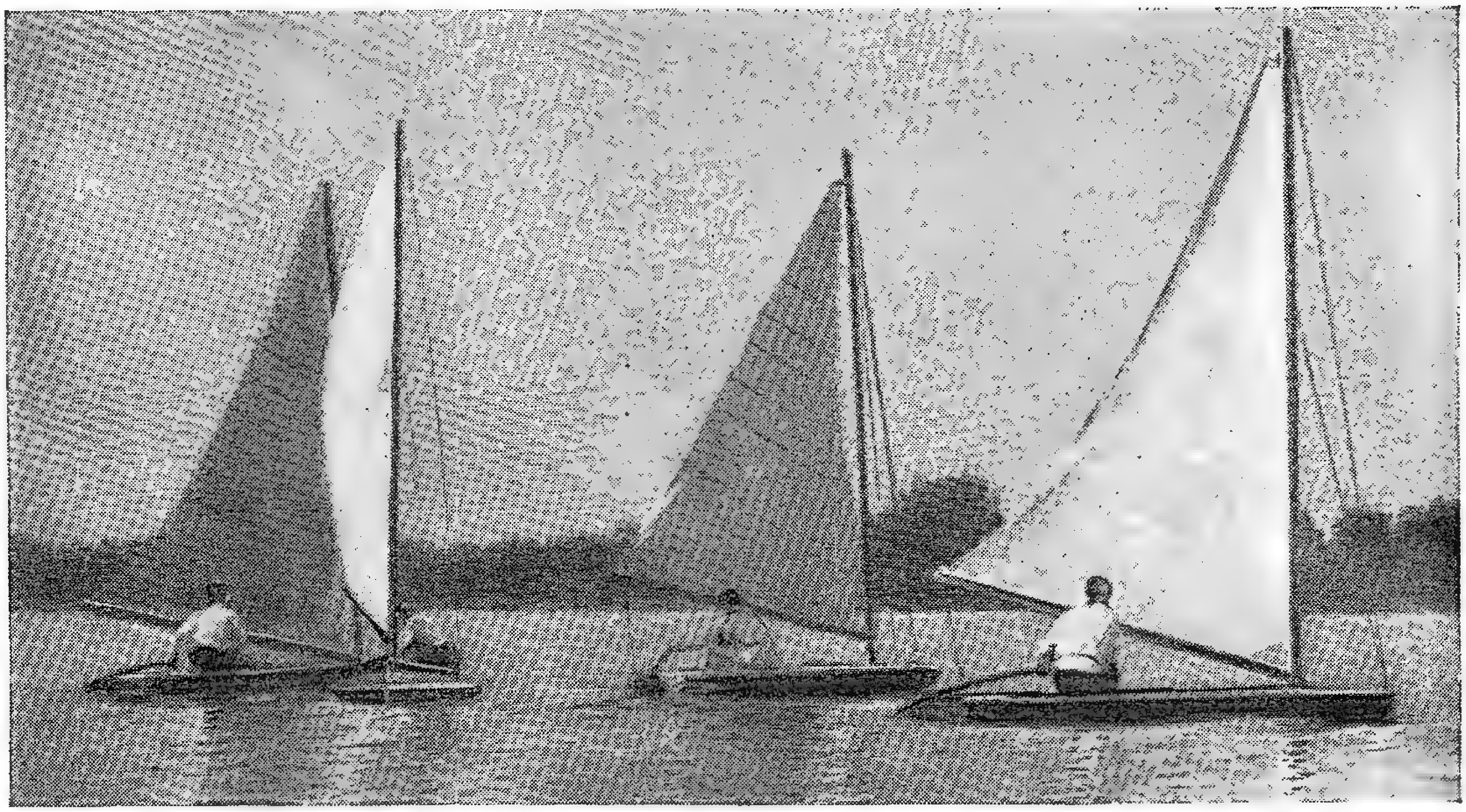
Address ____________________

City __________ State __________

☐ I prefer a one year subscription at $2.50 ☐ Two years at $4
($1.00 extra for foreign postage per year)



Chips from the



"When good fellows get together"—a fleet of four "Little Bear" boats constructed from MM plans by Minnesota fans.

PHOTOS of boats of all types and sizes from kyacks to sailboats as well as power boats featuring outboard, inboard and propeller-drive motors have flooded the Workbench this month, so in response to this expression of popular interest in home-built boats we are devoting the entire space to the subject.

* * *

Norman Schauer, of St. Paul, Minn., was awarded first prize of $5, for his letter and photo describing a fleet of MM boats. The letter reads:

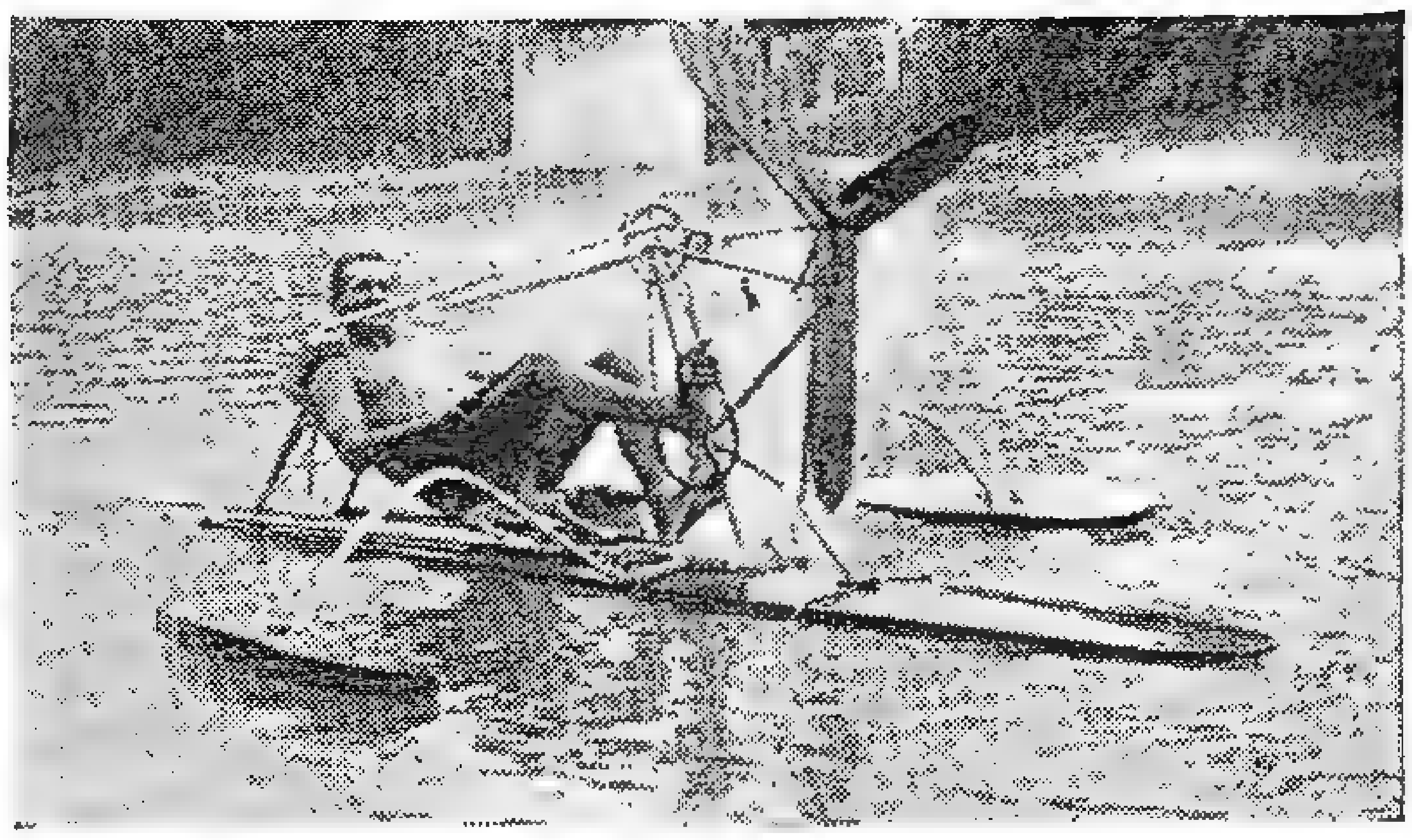
> Dear Editor:
>
> I am sending you a photo of four "Little Bear" boats constructed by George and Art Maguire, John Alden and myself, all of St. Paul. We thought you might be interested in the photo as the boats were built from plans in the MM book—"How To Build 20 Boats," 1936 issue.
>
> We are organizing a boat club and will soon have ten "Little Bears." Hoping for more plans for small boats in the future, I am,
>
> Norman Schauer.

Good work, fellows. The club angle sounds like a good idea and the 1938 MM boat book ought to interest your entire group. Copies are available from our Greenwich, Conn., office at the usual price of 50c per copy.

A photo and letter describing a very novel water craft won a $3 award for Fred Pilates, of St. Louis, Mo. He says:

> Dear Editor:
>
> As a physical culture specialist and a constant reader of MM I developed the "aircycle," shown in the enclosed photo. It is constructed of bicycle parts, mounted on a surfboard which is balanced on pontoons. Total weight is 30 pounds.
>
> Fred Pilates.

We have a strong hunch that reader Pilates will receive many inquiries from MM readers asking for construction details of his unusual craft.



Mounting parts of a bicycle on a surfboard balanced by pontoons, Fred Pilates constructed this novel "aircycle" boat.

Editor's Workbench

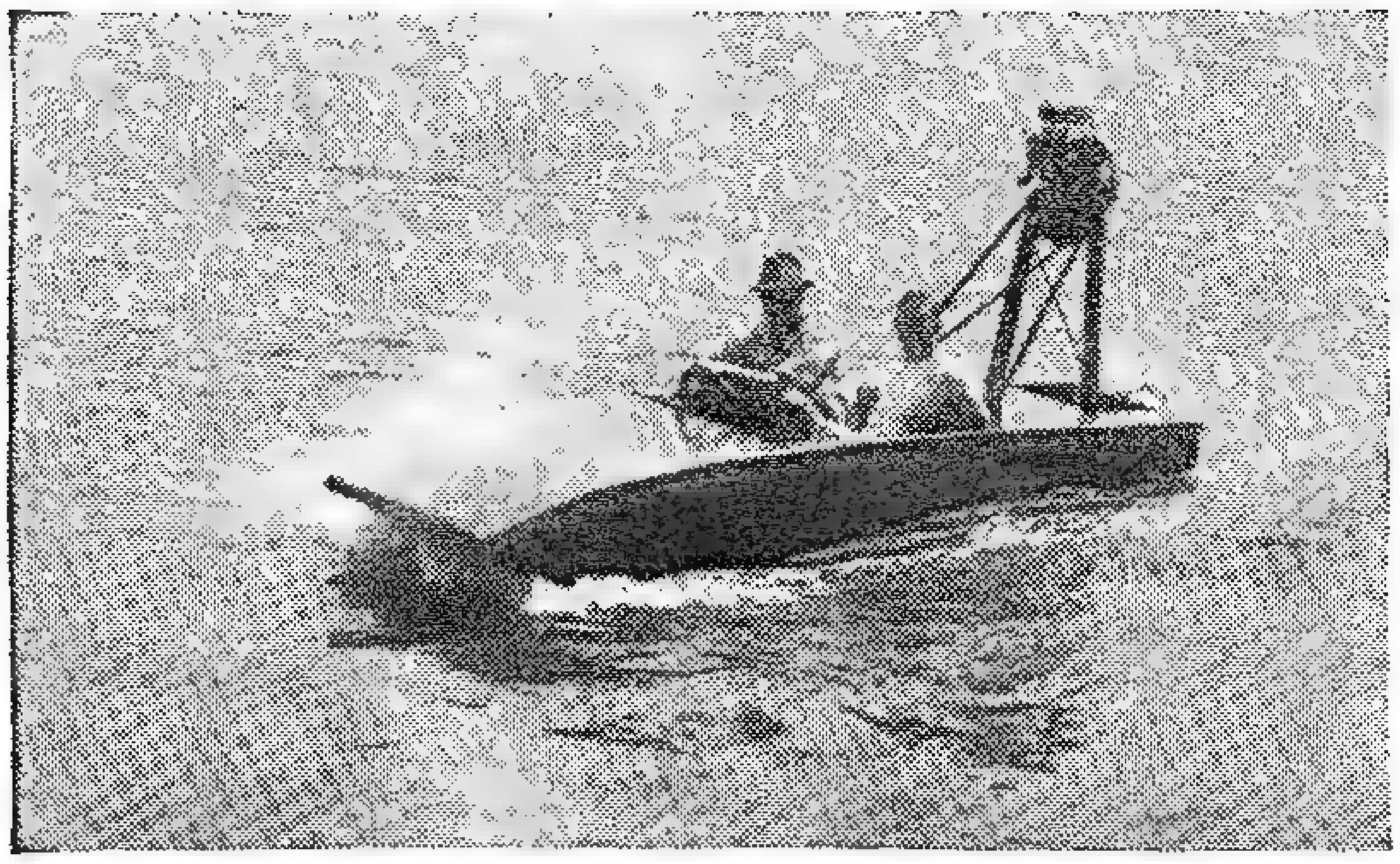
An interesting letter from far away Australia won a $3 award for H. V. Kenna. He writes:

> Dear Editor:
>
> I am a very keen reader of MM, especially the Editor's Workbench, and feel that I am at last eligible to write to you as I have completed my version of "Whizzer," the plans for which appeared in the MM boat book. The craft is powered by a motorcycle engine, fitted with a propeller of my own design and construction, and attains a speed of 20 m.p.h.
>
> H. V. Kenna.

Inasmuch as reader Kenna is a licensed airplane pilot, it was almost natural that "Whizzer" would tempt him as a construction project and he has certainly turned out a first class job.

* * *

Outboard fans will undoubtedly be interested in a letter and photo sent in by Warren Mathews, of Bound Brook, N. J., who also was awarded a $3 prize. He says:



Driven by an airplane propeller fitted to a motorcycle engine mounted at rear, H. V. Kenna's "Whizzer" travels 20 m.p.h.

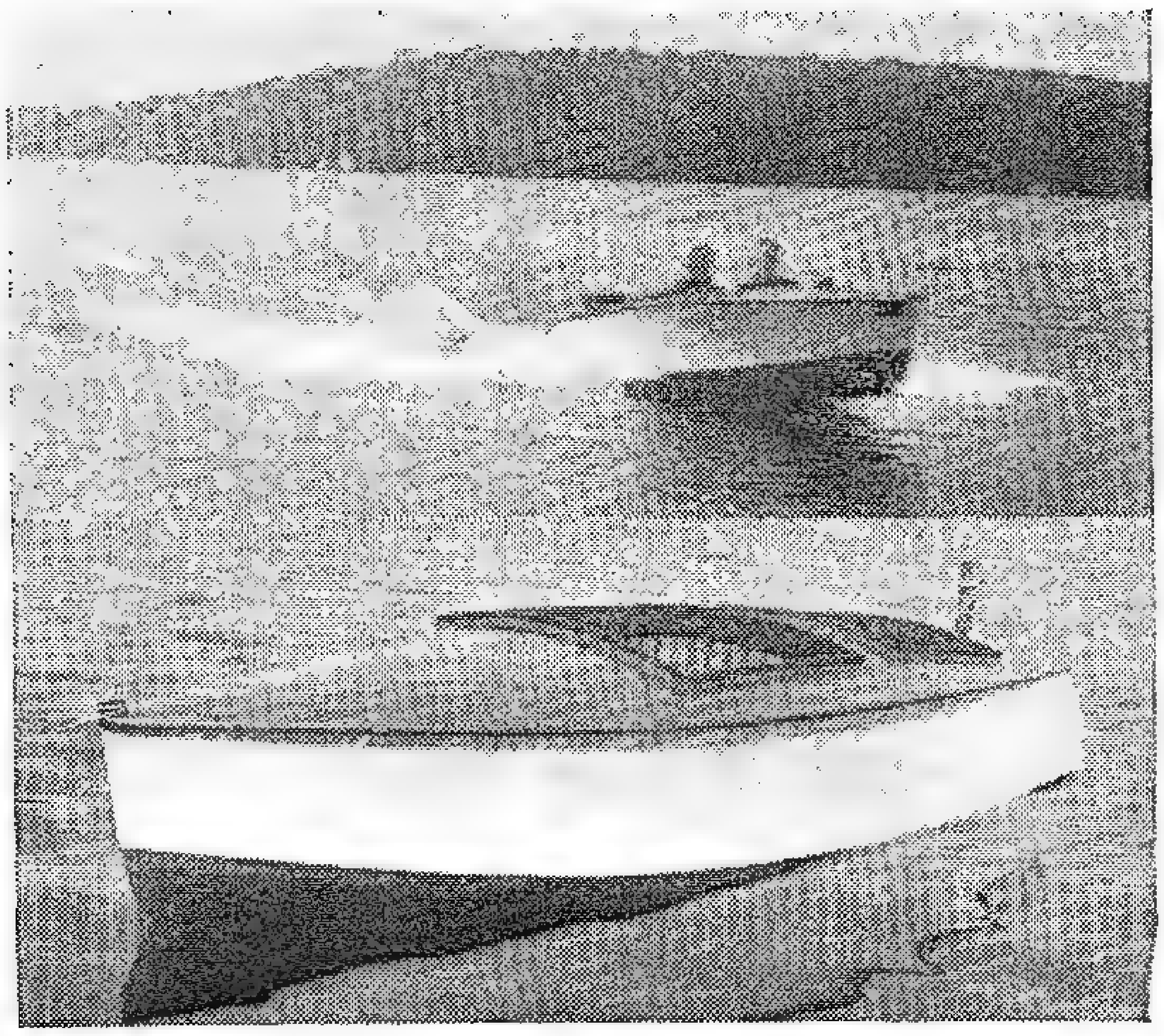
> Dear Editor:
>
> The enclosed photo shows "Buzzer," built to MM plans. It travels about 22 m. p. h., powered by a 25 horsepower outboard engine. My next project will be an inboard job, built to your plans.
>
> Warren Mathews.

Your "Buzzer" rivals many commercial boats in its appearance, Mathews, and we compliment you on your craftsmanship.

* * *

Another Minnesota reader who was awarded a $3 prize this month is James W. Spoor, of Cloquet, whose letter reads:

> Dear Editor:
>
> I am enclosing photos of a round bottom boat of my own design. It handles well with a 16 horsepower outboard and one of the photos shows its stability.
>
> I enjoy MM every month, especially the construction projects. Let's have more boat plans.
>
> James W. Spoor.



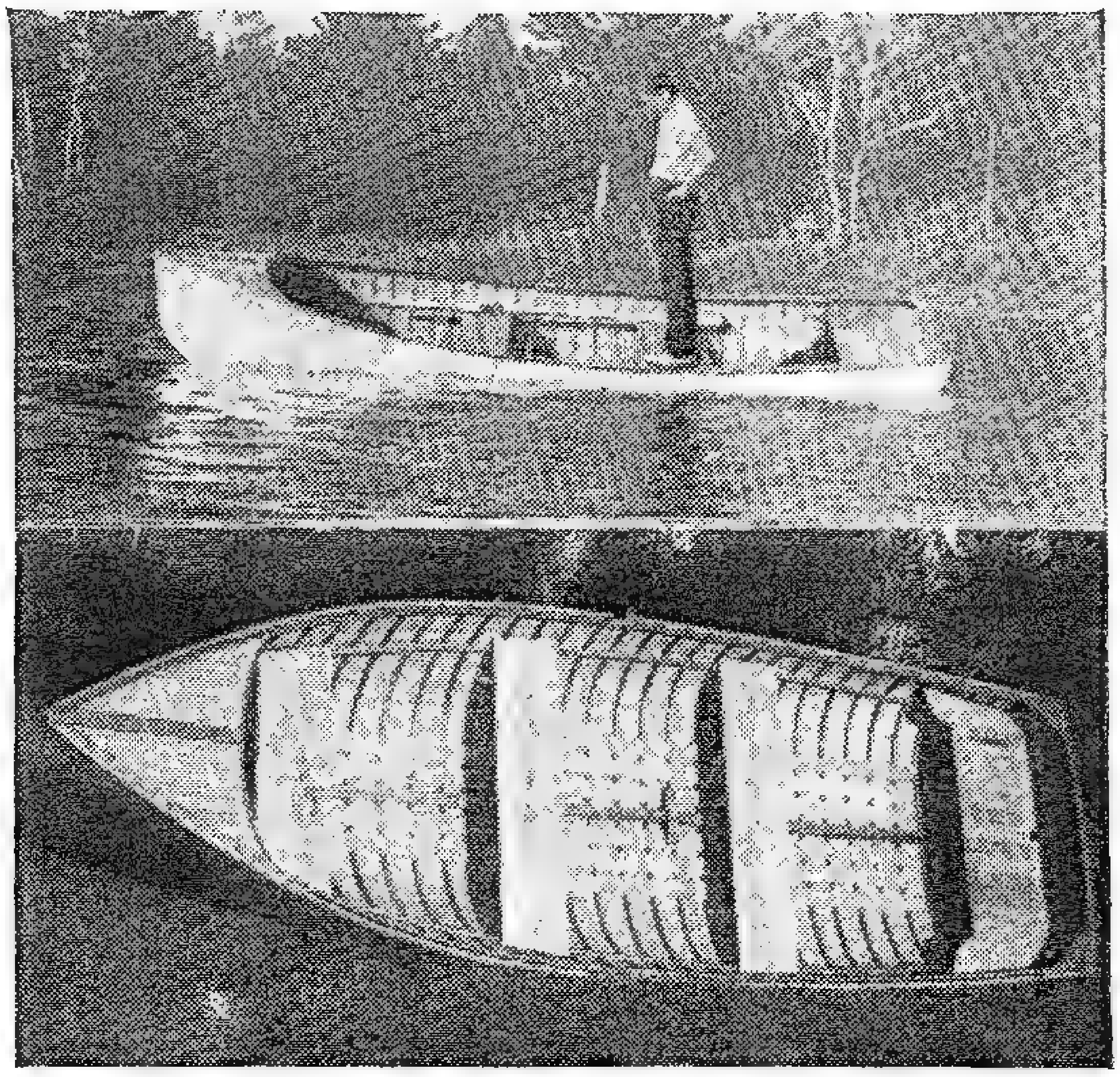
Warren Mathew's "Buzzer" outboard motorboat not only looks well, but sails well, too, judging from the above photos.

Spoor's boat certainly reflects his excellent knowledge of boat construction. However, with good plans and a few simple tools, reader, you, too, can build a small boat that will insure many healthy and happy outdoor hours during the coming summer months.

* * *

A letter and photo describing a home-built MM kyack won a $3 award for Bob Nissley, of New Brunswick, N. J. His letter states:

[*Continued on page* 31]



James W. Spoor's home-built 15-foot round bottom boat is so stable that a man can stand on the gunwale (top) without capsizing it. Lower photo shows construction details.

NEW INVENTION Electroplates SILVER·NICKEL COPPER·GOLD, Etc.

Amazing! New invention makes professional electroplating easy for everyone—at home. Just hook up LEKTRO-PLATER to dry cell batteries, auto battery, or home current—dip brush into metal solution—apply to any object just like paint. Presto! See how old, worn, dull, tarnished surfaces are **instantly** covered with new, heavy, bright **actual metal** surface! You can electroplate Nickel, Silver, Gold, Copper, Cadmium, etc.

Just "Brush" On The Actual Metal

So easy, a child can do a fine job. **Save money** by renewing life of hundreds of useful and ornamental objects in home, office, factory. **Make money** doing electroplating for others in spare time at home. Materials cost little—profits BIG.

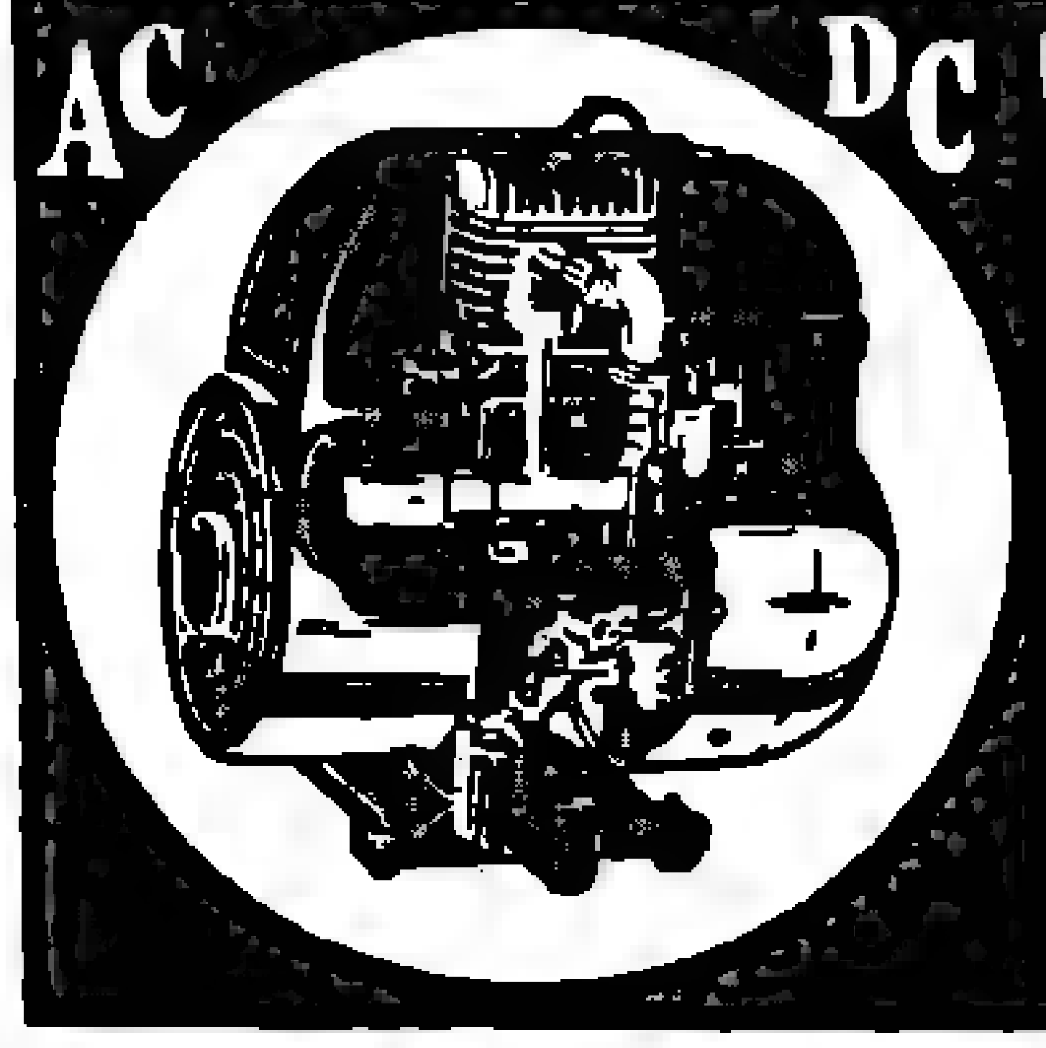
$1

PLATE LIKE NEW!
Silverware
Utensils
Jewelry
Auto Parts
Lamps
Fixtures
Ornaments

SEND NO MONEY!

Outfit costs only $1.00—ready to use. Generous supply of Silver, Nickel, Copper Metal Solutions, and cleaning compound included FREE of extra cost. Send no money. Rush name and address. Pay postman only $1.00 plus few cents postage on delivery of LEKTRO-PLATER, metal solutions, cleaning compound, and complete, simple directions. Use 10 days. If not delighted, return outfit to us and we'll refund purchase price. Rush order NOW. **LEKTRO-PLATER COMPANY, Dept. H-2153, 4208 Davis Lane, Cincinnati, Ohio.**

COMPLETE ELECTRIC PLANTS

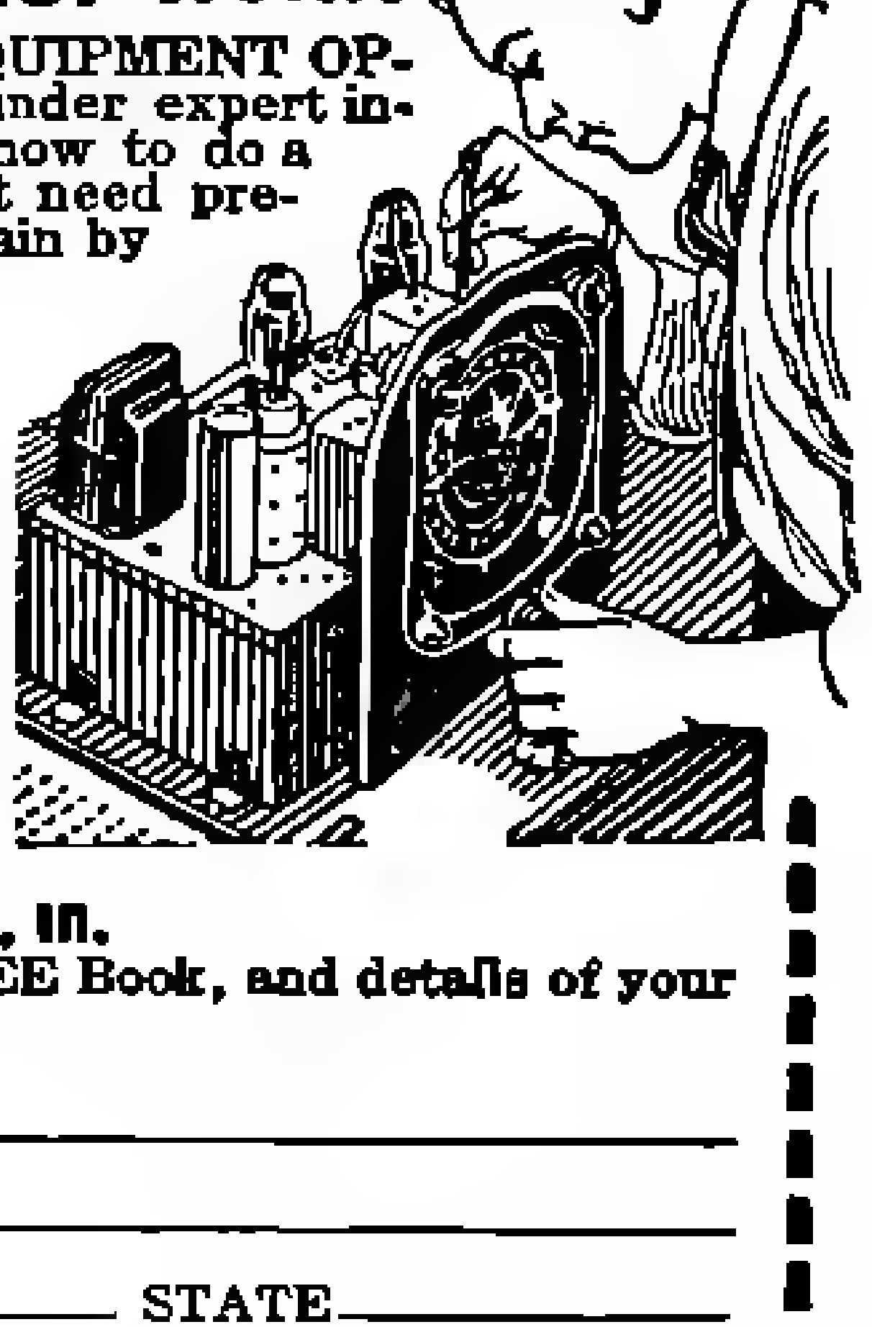


Onan A.C. plants furnish same current as city lines, 110 Volt, 60 Cy For **farms, camps, construction jobs.** Operate radios, water systems, all appliances. **New models, 350 to 5000 watts,** 6, 12, 32 and 110 volt D.C. Models $57 50 and up Also combination A.C-D.C units. Shipped **complete, ready to run.**

Write for details.

D. W. ONAN & SONS
1755 Royalston Ave
Minneapolis Minnesota

QUICK-EASY WAY TO TRAIN FOR RADIO IN 12 Weeks BY ACTUAL SHOP WORK



Prepare for RADIO, TELEVISION, SOUND EQUIPMENT OPPORTUNITIES. You learn on real equipment under expert instructors who First **Tell you--Then Show** you how to do a thing . . . **Then You Do It Yourself.** You don't need previous experience or a lot of book learning to train by this simple "Learn by Doing" method.

PAY AFTER YOU GRADUATE IN SMALL MONTHLY PAYMENTS

Send the coupon today and I will tell you all about my quick, easy way to train in 12 weeks. Train first--then pay in **easy monthly payments** starting 60 days after your 12 weeks training. **Earn While Learning. Employment help after graduation.** Electric Refrigeration Training NOW included at no extra cost.

H. C. Lewis, President,
Radio Div., Coyne Electrical School,
500 S. Paulina St., Dept. 58-1H, Chicago, Ill.

Dear Mr. Lewis: Please send me your Big FREE Book, and details of your "PAY-AFTER-GRADUATION" PLAN.

NAME ______________________

ADDRESS ______________________

CITY ______________________ STATE ____________

TIRE PUNCTURED 27 TIMES.. LEAKS NO AIR

1001 Repairs In Home, Auto, Farm For Only 1¢ EACH

New plastinoid "putty"—**SO-LO**—fills cracks, holes in tires, shoes, boots—anything of rubber, leather or cloth. Spreads on like butter. Dries tough. Waterproof, flexible, non-skid. Won't come off—guaranteed! 25c package (25 repairs) shows many uses. At any 10c or hardware store.

So-Lo

LEARN WATCH REPAIRING

AT HOME You can learn by our modern and original system of instruction every part of the **Watch repairing Trade** at home. You can earn money while learning and prepare yourself for a well paying position or start in business after completing our course of instruction. Good watch repairers are in demand and generally earn very good salaries. For particulars apply to the

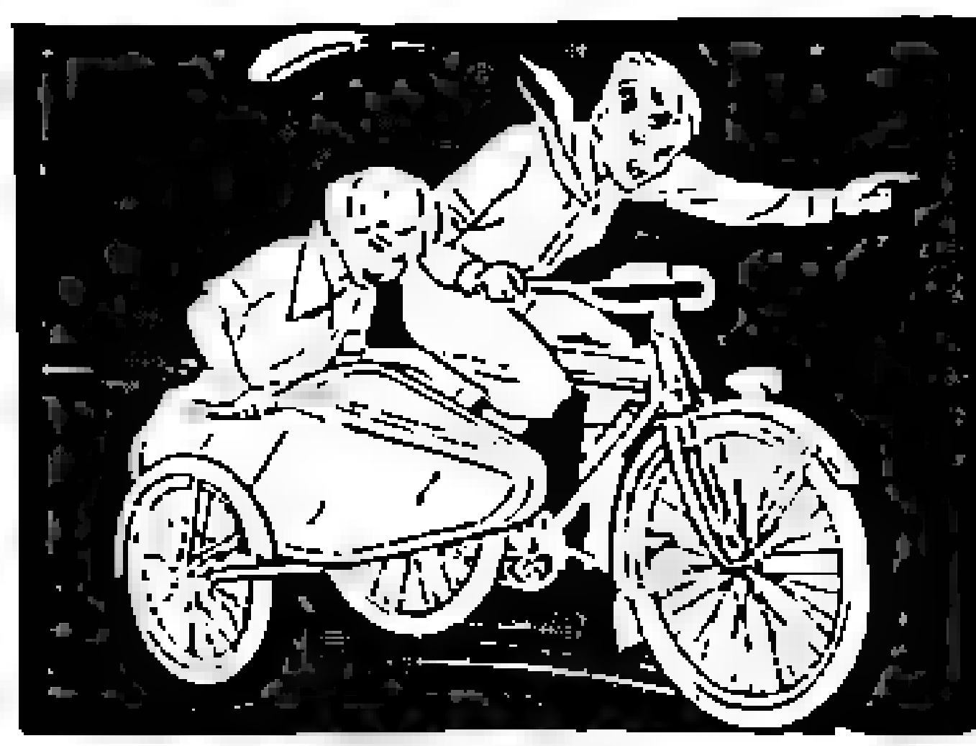
WISCONSIN SCHOOL OF WATCH REPAIRING
524 E. Mason St., Dept. C, Milwaukee, Wis.

LOCKSMITHS FREE BOOK

If you are a locksmith, or cut keys, this Book will be invaluable. Write for it on your letterhead or business card. It's FREE.

H. HOFFMAN CO.
6846 N. WESTERN AVE., CHICAGO

BUILD SIDE CAR!



PAL-CAR

With or Without Motor
Easy to Build—Loads of Fun!
PASS. OR DELIVERY—FITS ANY BICYCLE QUICKLY ON OR OFF—NOT A TOY
Be First to own a PAL-CAR
The Cost is Small With Complete PLANS—Pictures—Instructions— 40c
PAL-CAR, 408 N. Lawler, Chicago

PARKS AIR COLLEGE
PARKS AIRPORT EAST ST. LOUIS, ILL.

Offers you college education majoring in aviation

Four courses lead to B. S. degrees in Professional Flight, Aviation Operations, Maintenance Engineering, Aeronautical Engineering. 100 acre airport. 14 buildings, 33 in faculty 302 enrolled for Fall term. 6,400,000 miles flight training. 1,562 planes. 538 engines repaired and rebuilt in shops. Graduates with all leading aviation companies. Dormitories, dining hall on field. Summer term July 5th. Catalog. Write

11th YEAR **REGISTRAR, DEPT. MM-5**
PARKS AIR COLLEGE, EAST ST. LOUIS, ILL.

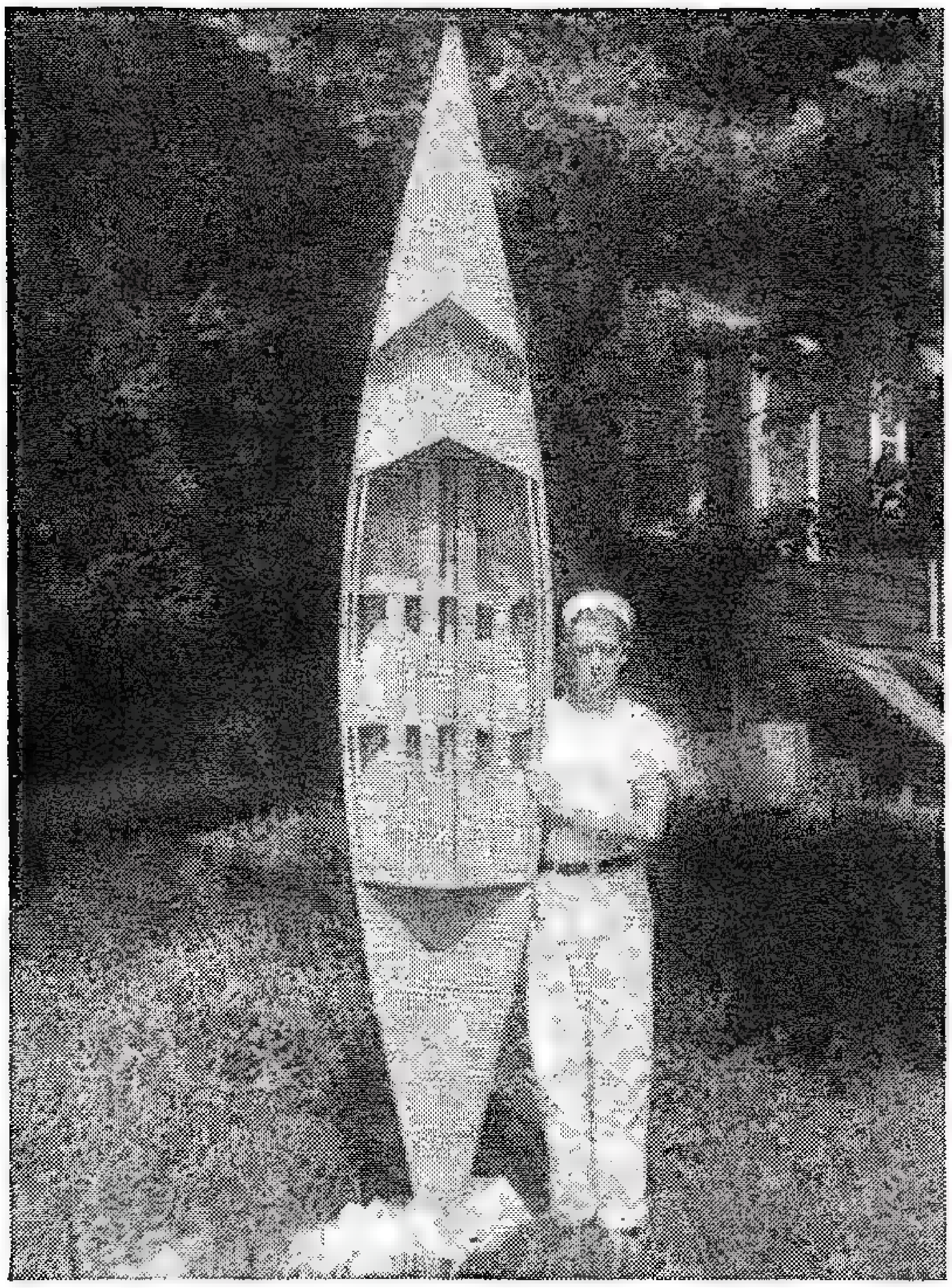
CHEAPER TENNIS

Earn Money, Too!

NOW—you can buy Wills' fresh, genuine **Eclipse SPLIT GUT** tennis strings direct-from-factory for as little as $2.25 PER SET postpaid. Also—excellent quality SILK at only 65c per 37 ft. coil, postpaid. Rush your order now! Satisfaction **GUARANTEED.** New 1938 CATALOG of Tennis Frames, Vises, equipment now ready. Get your FREE copy. Send today. **H. E. WILLS CO., Dept. 2355, 1047 W. 47th St., CHICAGO, U. S. A.**

Editor's Workbench Chips

[*Continued from page* 29]



Bob Nissley, of New Brunswick, N. J., poses with the 12-foot kyack he constructed from plans in the MM book—"How To Build 20 Boats." Hull is painted green, but deck is natural.

Dear Editor:

I am enclosing a photo of a kyack which I built from plans in your "How To Build 20 Boats" book. Only a few minor changes were made in the final assembling, so it really is an MM boat.

My kyack is 12 feet long, 22 inches wide, and 8 inches deep. The hull is painted green while the inside, keel and deck are varnished natural.

Bob Nissley.

Nissley's kyack appears to be well constructed and we know he will have plenty of fun with it during the boating season. If you, too, are interested in building a boat get a copy of the MM boat book—"How To Build 20 Boats"—and start construction now so you can launch your craft at the start of the summer. The book is priced at 50c per copy.

Every reader of MM is invited to send in photos and letters describing completed workshop projects. We prefer to use photos of projects constructed from MM plans, but we assure readers that consideration will be given to all photos.

A list of addresses of manufacturers of items mentioned in MODERN MECHANIX will be sent to any reader upon receipt of a stamped, return envelope.

Only 22¢ a Day Puts This All-Purpose ELECTRIC ARC WELDER IN YOUR SHOP

TEN DAY TRIAL GUARANTEED

Details FREE

STOP THROWING AWAY PROFITS! DO YOUR OWN WELDING! That's the modern way to increase income and customer satisfaction. **And, it takes only 22¢ a day to do it.** Yes, you get the sensational, professional, ALL-PURPOSE Commonwealth Arc Welder—Model 120-FS, for only 22c a day. Ten whole months to pay out of profits. Now, for the first time, it is EASY for every inventor, laboratory, home workshop owner, garage, repair shop, and factory to afford a complete welding service for manufacturing, maintenance, experimental or repair work.

Works on 110 or 220-Volt A. C.

Simply plug into a 110 or 220-volt, 60-cycle A.C. line. Economical—costs only a few pennies an hour to operate. Often pays for itself on first or second job. Portable—can be carried right to outside jobs in auto, truck, or side car. Anyone can weld with its easy-striking, automatically-stabilized arc. Comes complete with helmet, electrode holder, welding rod, etc. Nothing else to buy. Fully Guaranteed. Breath-taking low price! Saves and makes hundreds of dollars.

Handles ALL Welding Sheet Metal to Heavy Castings

Model 120-FS is a big, 110-pound, man sized, heavy-duty welder with efficiency of machines costing many dollars more. Welds iron, steel, cast iron, cast steel, and alloys of them. Six heats handle everything from fenders and light sheet metal to motor blocks and heavy castings. Also fine for soldering and brazing. Uses standard welding rods. No experience or special training needed to operate. Simple, complete instructions for doing all kinds welding jobs included. MAIL COUPON BELOW for complete FREE details.

COMMONWEALTH MFG. CORP.
Dept. H-52, Cincinnati, Ohio

MAIL COUPON FOR DETAILS GET 22¢ A DAY PLAN

Commonwealth Mfg. Corp., Dept. H-52,
4208 Davis Lane, Cincinnati, Ohio.

Please rush me at once, FREE, all details about Model 120-FS Electric Arc Welder with DeLuxe Accessories and your 22c-a-day plan.

Name ....

Address ....

Town .... State ....

Amazing NEW GLAZE Beautifies and Protects

Car Owners! Meet MASTER GLAZE – the sensationally different luster for new and used cars!

Not a wax – not an oil polish – not a paint – nothing that "smears" over the surface. A creamy liquid – quick and easy to apply! Gives a hard, glass-like surface. Even gasoline cannot dull it! Lasts six months to a year! Amazing luster – beautiful, sparkling clean and brilliant! Doesn't fingermark – doesn't smear! Seals the pores – protects! Nothing like it!

FREE Write now for Free booklet and **SAMPLE OFFER.** Free Trial offer. Just send your name and address.

AGENTS
Unusual opportunity. Quick demonstrator — big profits. Good territory. Write today.

MASTER GLAZE CO., 7720-29 W. HARWOOD AVE., MILWAUKEE, WIS.

Preserve Your
Copies of

MODERN
MECHANIX

For handy reference with these handsome binders.

Made from beautiful red simulated leather embossed in gold, the binders hold six issues each. Magazines are conveniently bound with a snap and are held positively in place; holes need not be punched nor copies marred. MODERN MECHANIX and the year specified are stamped in gold on the backbone. Volume I and Volume II to represent the first and last six issues of the year will also be imprinted in gold if desired.

Each $1.25 plus 15c postage in continental U. S.
($1.25 plus 75c postage elsewhere)

MODERN MECHANIX
Fawcett Bldg., Greenwich, Conn.

Enclosed is $.... for ..... MODERN MECHANIX binders.

Imprint year (years) ....

Imprint year and volume number (years and volume numbers) ....

Name ....

Address ....

City .... State ....

EASY-

SOPRANI AMPLIPHONIC
Simplifies Playing

● **Lighter, easier to play, less bellows-ing, plus more beautiful tone and volume, — that's how Soprani's exclusive Ampliphonic feature has simplified this accordion.** ***Assures rapid progress.*** **Home trial. Easy terms. See your music dealer or send for** ***beautiful free book. Write today.***

193 "Skeeter" Palmer
New York, with
his Soprani

SOPRANI, INC. Dept. 534, 630 S. Wabash Ave.
Chicago, Illinois

ELECTRICAL ENGINEERING

ONE YEAR condensed course prepares for technical work in the electrical field. Thorough training in principles, with practical applications in laboratory and shop. High placement record. Modern buildings, dormitory, dining hall. Campus. 46th year. Catalog on request.

BLISS ELECTRICAL SCHOOL
295 Takoma Avenue
Washington, D. C.

FREE SUITS & BIG PROFITS as a Bonus
Sell "MOVIE STAR" Styles
In Made-to-Order Suits $15.95 UP

Buddy Rogers

Show friends Made-to-Order Clothes "Styled for the Stars" at big savings. New Fashions, Fabrics, inspired by Hollywood's fashion plates. Buddy Rogers, Cesar Romero, others. Take orders spare time. Earn big profits, your own suits Free as bonus. Our clothes guaranteed to fit and satisfy. Big outfit 100 large samples Free. Write today.

JIM FOSTER, INC., Dept. D-5
2253 So. Spaulding Ave. **Chicago, Illinois**

AVIATION
APPRENTICES

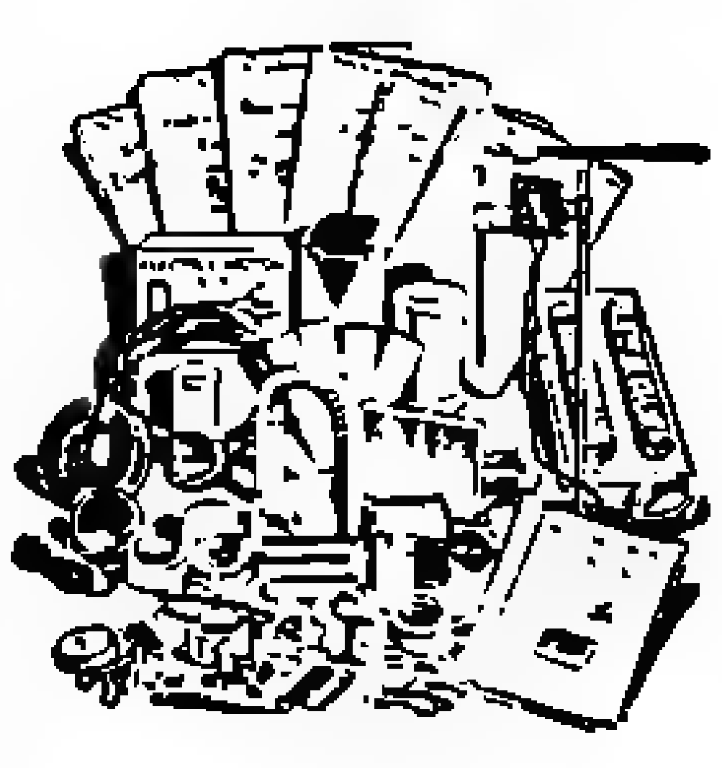
BIG PAY **GOOD FUTURE**

If you are interested in working yourself into a highly paid position in Aviation under our Apprentice-Plan—Write, immediately, enclosing stamp—

MECHANIX UNIVERSAL AVIATION SERVICE CO.
Strathmoor Station **Dept. A** **Detroit, Mich.**

MAKE HUNDREDS OF FASCINATING
Radio-Electrical EXPERIMENTS

ONLY $3.99
6 Books FREE



25 pieces genuine commercial apparatus with illustrated manual! Build radio circuits, 110-volt motor, extension phone, thief detector, arc light, arc furnace, electric stove, generate ultra-violet rays, many more.
SAVE 60%—Send only $3.99 for kit and 6 Radio-Electrical books (value over $10). Money back if not pleased. Order NOW!

ELECTRICAL SALVAGE CO., Box 524-79, Lincoln, Nebr.

INVENTORS
BE SUCCESSFUL

Read Invention & Finance—It's your chance to make money. Two year subscription $1.00 entered upon promise to pay on receipt of first copy. Place your order by cutting out and mailing this advertisement.

INVENTION & FINANCE MAGAZINE
80-H WALL ST., NEW YORK, N. Y.

Diesel Motors Gain In China

DIESEL motor vehicles registered in China at the end of 1936 increased by 585 units, or 100 per cent, compared with the preceding year to total 1,110 units, according to a report to the Department of Commerce from Assistant American Commercial Attache A. Bland Calder, Shanghai.

Between 500 and 1,000 gasoline motor trucks and buses in China have been converted to use charcoal burning devices and despite the acknowledged loss in power on grades and the adverse effect of this fuel on such cylinders and pistons the use of such equipment is increasing, Mr. Calder reported.

Diesel motor vehicles are favored in China because of the possibility of their operation on vegetable oils which are indigenous to the country, according to the report.

Fast Cooking Stove Is Cool

A COOL cook stove that boils cold water in 30 seconds and percolates coffee in 36 seconds has been placed on display in Chicago.

This stove is a far cry from the old time cook stove that turned the kitchen into a hotbox and heated the cook's temper. It was placed on display at the opening of the exposition of solid fuel in connection with the annual convention of the American Retail Coal Association.

The stove burns anthracite or coke, and is the invention of Dr. Gustaf Dalen, a Nobel prize winner in physics. It embodies the principle of stored heat for cooking.

Insulation keeps the heat concentrated. Its demonstrators said there is no radiation of heat and consequently all parts of the stove outside of the plates and ovens are cool. The temperature in the room, therefore, is not affected.

A list of addresses of manufacturers of items mentioned in MODERN MECHANIX will be sent to any reader upon receipt of a stamped, return envelope.

NOTICE

Changes in the make-up and title of this magazine, designed to make your favorite publication better than ever before, will become effective with our next issue. Be sure and reserve your copy now. Our new name will be—"MECHANIX ILLUSTRATED."

Read the Sworn Statements of Motorists

Who Else Wants To SAVE GAS?

CHICAGO

SAN FRANCISCO

"$19.38 SAVINGS IN GAS" Says **J. SMEAD**

On Trip San Francisco To Chicago

Auto owners of every make write us our Amazing Improved Auto GAS ECONOMIZER helps them get more miles per gallon of gasoline and SAVE up-keep cost.

Eddie Mashak says, "32 MILES ON A GALLON"

where I made 23 before. Self-regulating—anyone can attach.

"8 MILES MORE per Gallon" says G.R.Harman

"5 MILES MORE per Gallon" says F.L.Van Ness

New Improved Gas Economizer

SENT ON TRIAL

For 30 DAYS—Costs Nothing if it does Not Save Gas and save running expense—but, that's not all, we will even pay you a bonus for testing it if not delighted—so you can't lose.

Without obligation SEND TODAY your name and address on coupon below or paste coupon on 1c postcard—MAIL NOW.

AGENTS SALESMEN BIG MONEY

Startling demonstrator — convinces. T. M. Wiley says "Cleared $39 in 3 Hours—on previous Saturday $18." Get money making plan and offer of NO-COST SAMPLE. Write quick—be first in your locality.

Mail Coupon

J. A. STRANSKY
MFG. CO.,
E-600, Pukwana,
So. Dak.

J. A. STRANSKY MFG. CO., E-600, Pukwana, So. Dak.

Without cost or obligation, send your TRIAL OFFER and GUARANTEED BONUS OFFER.

Name ______________________

Address ______________________

City ______________ State ________

☐ CHECK HERE if interested in NO-COST SAMPLE and money making plan.

For..BIG Money-Making..Doing ALL Work

Use The EIFEL-GEARED PLIERENCH KITS

10 to 1 1-TON POWER-GEAR

7" & 8½"

● It's 10-to-1, 1-TON, Power-Gear gives your hands 1-Ounce to 1-TON Gripping Pressures and amazing working power and skill. ● With the Universal Gear-jaw, No. 1, it is a Super Parallel Pliers, Lock-&-Ratchet Wrench, Hand-Vise . . with 4-Way V-Grips, Wire-Cutter, Screwdriver, etc., etc.

● With PIPE Gear-Jaw, No. 2, holds and Turns Pipe tight to a wall, nearly flush sink nipples; basin nuts and chewed nuts in Tight places . . Hard wrist pins, shafting, etc.!

● With WIRE Gear-Jaw, No. 3, Coils up to ¼" wire; makes Springs; Holds Washers, Ends of Tubing and Pipe, and does 101 'odd' and amazing things.

● You Get ALL 3 . . a $50 Tool Service . . at the Price of ONE Good tool in the 8½" (20-Oz.) KIT; or, in the 7" (12-Oz.) KIT; and, the 2 KITS give you 9 Different Super-2-Tool Combinations!

● WHAT'S MORE..These "Miracle KITS" are making $30 to $85 WEEKLY for AGENTS and DISTRIBUTORS, and we Need More..

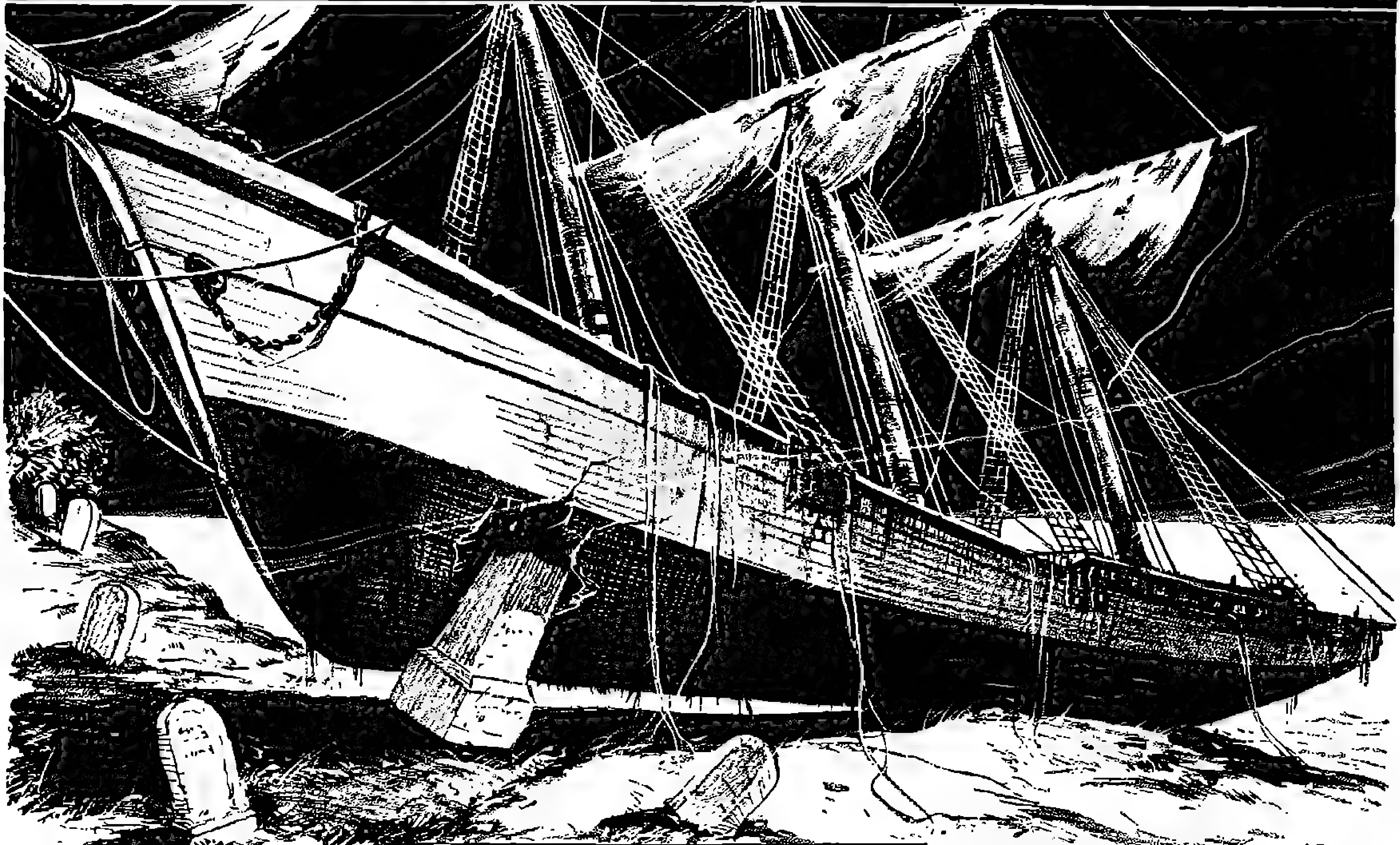
● MAIL this Part of Ad TODAY with your Address (on a Postcard will do), Get FREE—this 7-Edge-End-&-Angle SCREWDRIVER (It Turns Screws in ALL Positions and does many useful things) . . and 101-PICTURE MANUAL OF MECHANICS, with . . ☐ User Offers; or, With . . ☐ DISTRIBUTOR, Territory and Demo. Kit Offers!

FREE

AMERICAN PLIERENCH CORP'N MME-4611 Ravenswood Ave.
CHICAGO, ILL.

Ship Selects Graveyard Ashore

Nic Sprank Offers $5.00 For Best Oddity



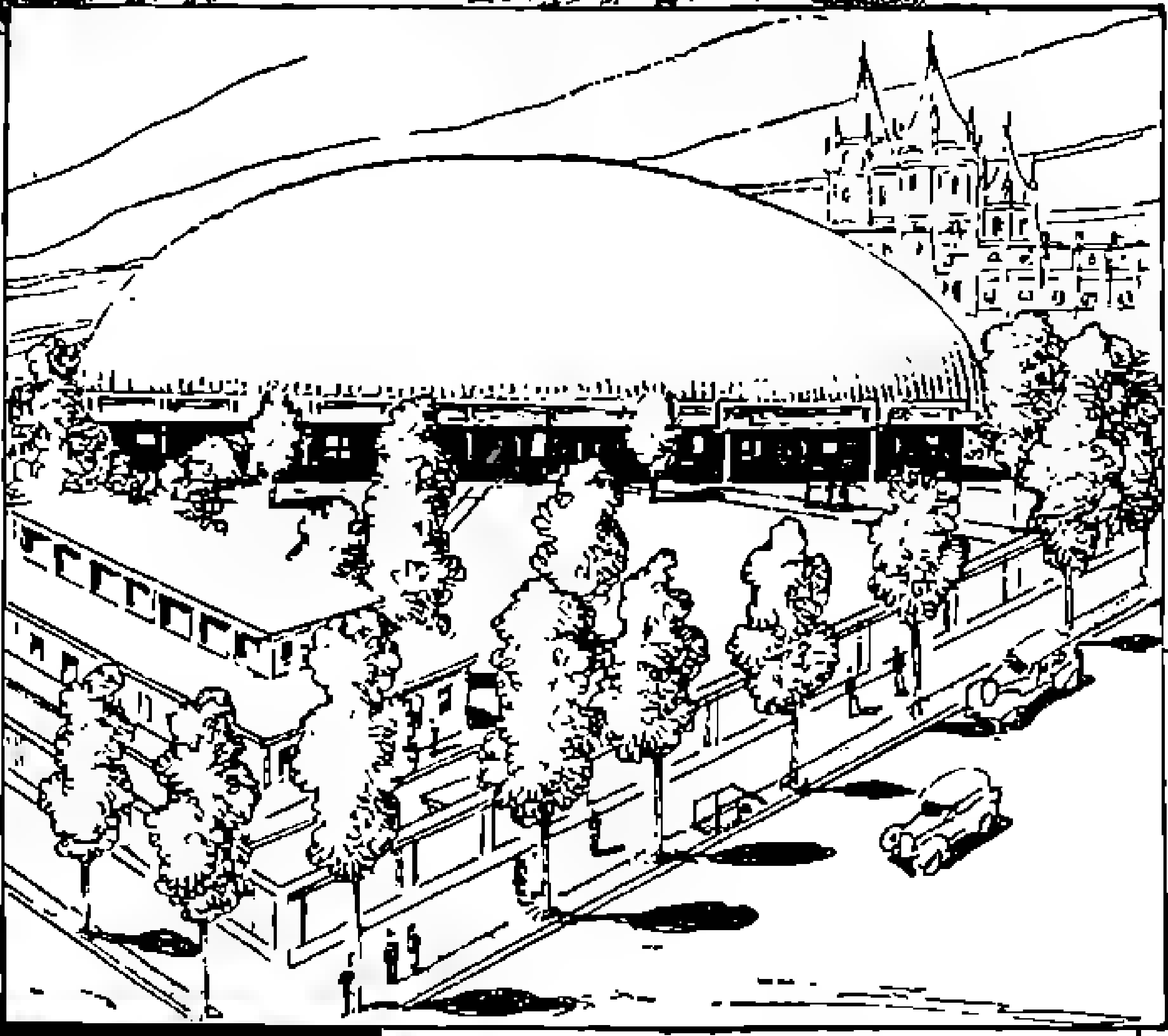
SHIP REACHES GRAVEYARD! THE BARK UMVOTI, STRUCK BY A HURRICANE IN THE INDIAN SEA, WAS DRIVEN ASHORE NEAR MADAGASCAR AND LEFT STRANDED IN A GRAVEYARD. A TOMBSTONE PIERCED HER HULL.

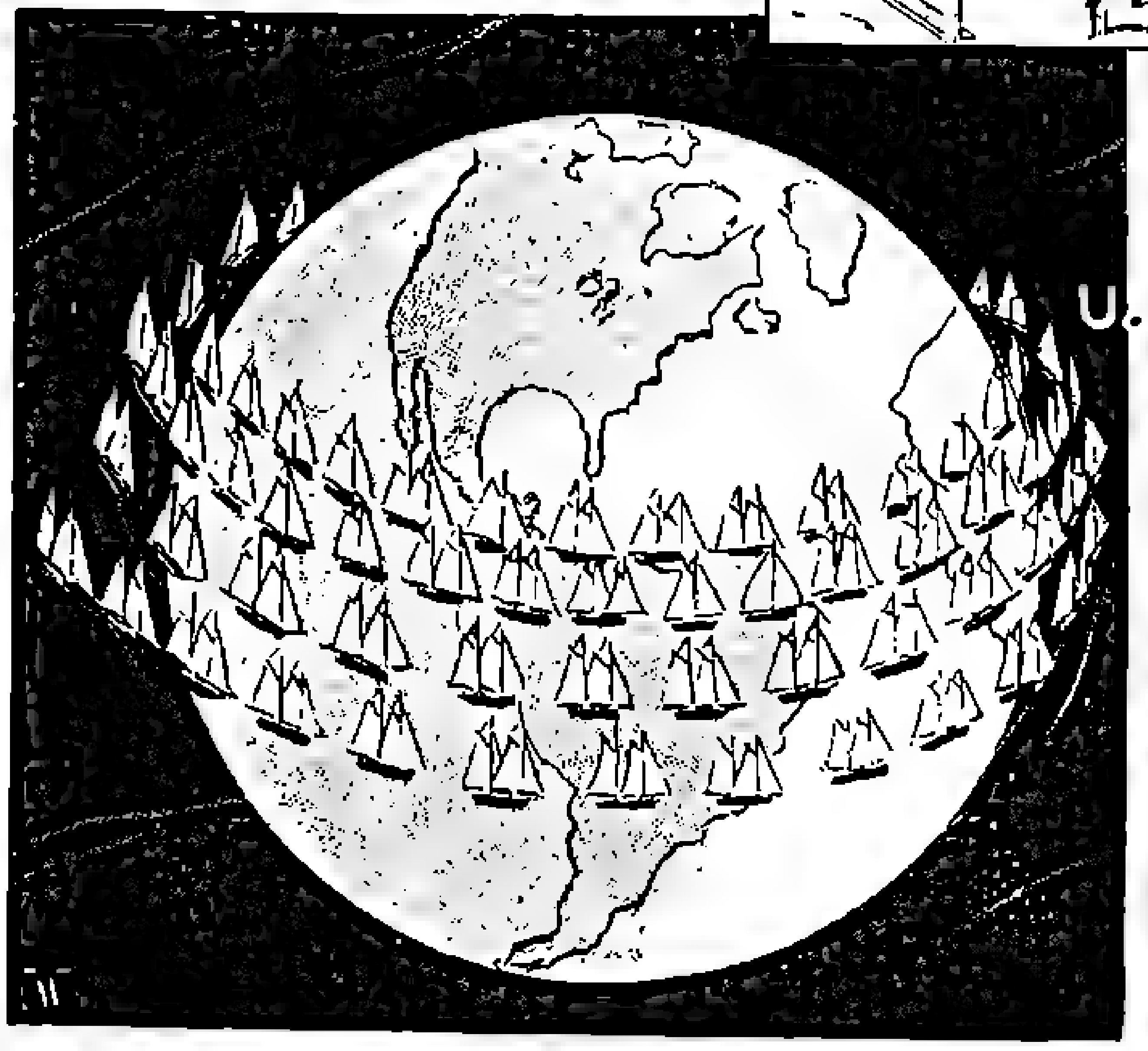
-Betty Burke, Malverne, N.Y.

Nic Sprank

HEAR A PIN DROP! THE ROOF OF THE MORMON TABERNACLE, IN SALT LAKE CITY, REFLECTS SOUND SO PERFECTLY THAT A PIN DROPPED ANY PLACE IN THE AUDITORIUM CAN BE HEARD 200 FEET AWAY.—

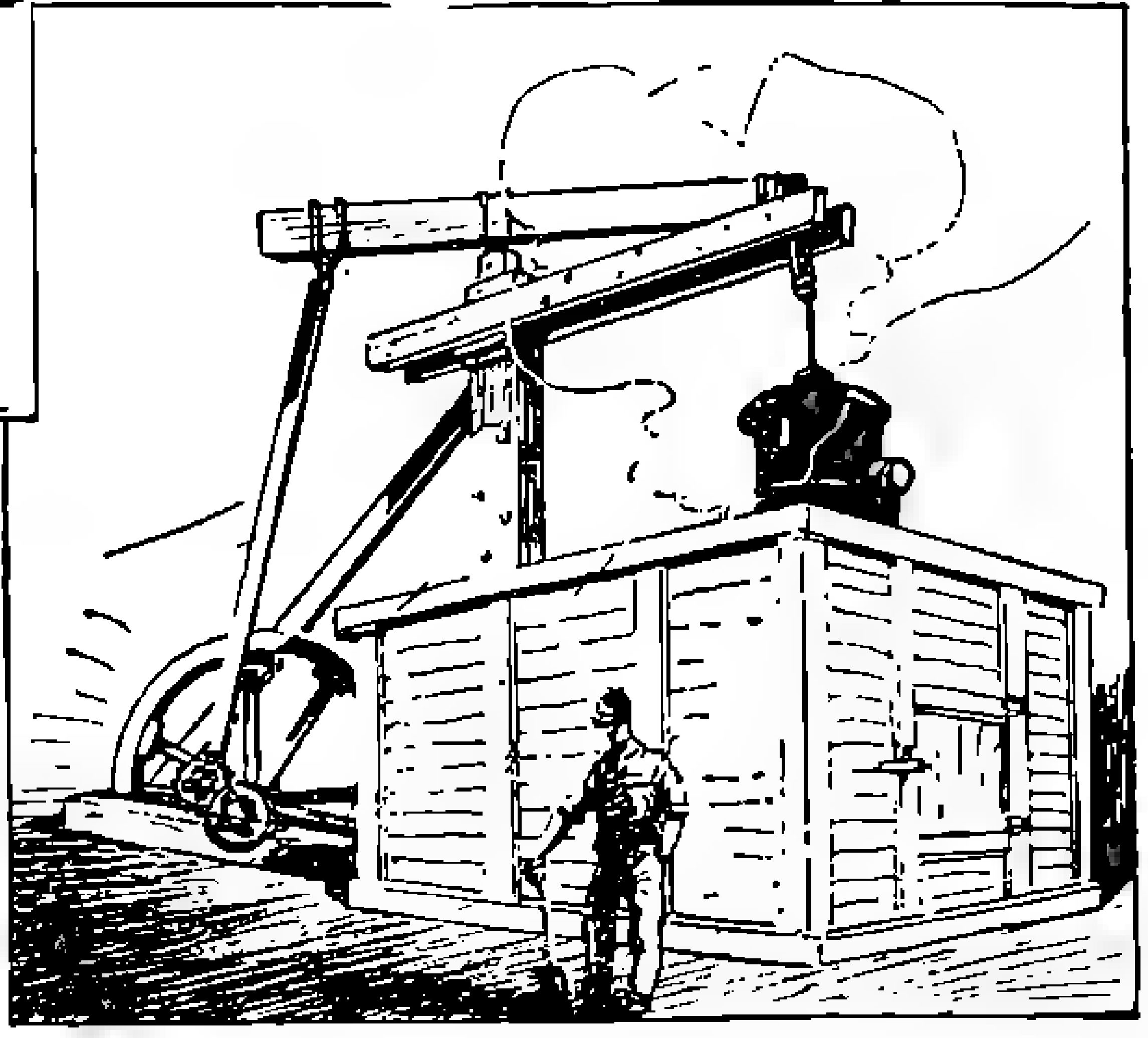
-J. Grizzaffi, Port Arthur, Tex.





U.S. SEABOARD MEASURES 103,000 MILES!—THE SHORE LINE OF THE UNITED STATES IF STRETCHED OUT WOULD MEASURE 103,000 MILES, OR MORE THAN FOUR TIMES THE DISTANCE AROUND THE WORLD.

-W. Lister, Pearl River, N.Y.



STEAM ENGINE HAD WOODEN BOILER!— A STEAM ENGINE PUT INTO SERVICE IN A PUMPING STATION AT THE FOOT OF CHESTNUT STREET, PHILADELPHIA, PA., IN 1801 HAD A BOILER MADE OF WOOD.—

—R.V. King, Girard, Pa.

Five dollars will be paid for the oddity selected by Nic Sprank as the best of the month. One dollar will be paid for all others used on this page. Send your oddity to Nic Sprank, Editorial Office, Modern Mechanix, 1501 Broadway, New York, N. Y. Source or proof of each oddity must be given. Send all oddities separately, not with other manuscripts or letters.

MAY, 1938
VOL. XX - NO. 1
W. H. FAWCETT
PUBLISHER

MODERN MECHANIX

YOUR NEWSPAPER BY RADIO!

A PRIVATE newspaper with any spot in your home as the press room, the world's best editors and reporters on your staff, and the radio as your copy boy—this is not the dream of Jules Verne—but an actual accomplishment, available today to anyone in the United States owning an ordinary radio receiver.

No thundering press will deafen you when your paper is printed, but instead, equipment contained in a small, attractive box, will silently print your "latest edition" while you sleep, completing it in time for reading at breakfast.

Facsimile transmitters and printers have been announced by two manufacturers, Finch Telecommunications Laboratories, Inc., of New York City, and RCA Victor, of Camden, N. J.

Predicted to be in wide-spread use within the year, many large broadcast stations have started tests with the system, and actual broadcasts on a definite schedule will be an accomplished fact as soon as these tests are completed. Of great significance is the fact that the Federal Communications Commission has granted the broadcasters permission to operate the facsimile equipment on the regular broadcast frequencies. Translated into actual use, this means that when the householder is through listening to his favorite station, he merely turns a switch which will, at the correct time, again turn on the radio for reception of the same station, but this time instead of sounds emitting from the loudspeaker, an up-to-the-minute newspaper will unfold.

At present one of the largest eastern broadcast stations, WOR, is supplying this type of transmission, though not yet on a regular schedule. It is being done both on the regular broadcast channels as well as on the ultra-short waves. Plans are under way for regular service of facsimile transmissions early this spring.

Among other stations that have received F.C.C. permission to make facsimile broadcasts are WGN,

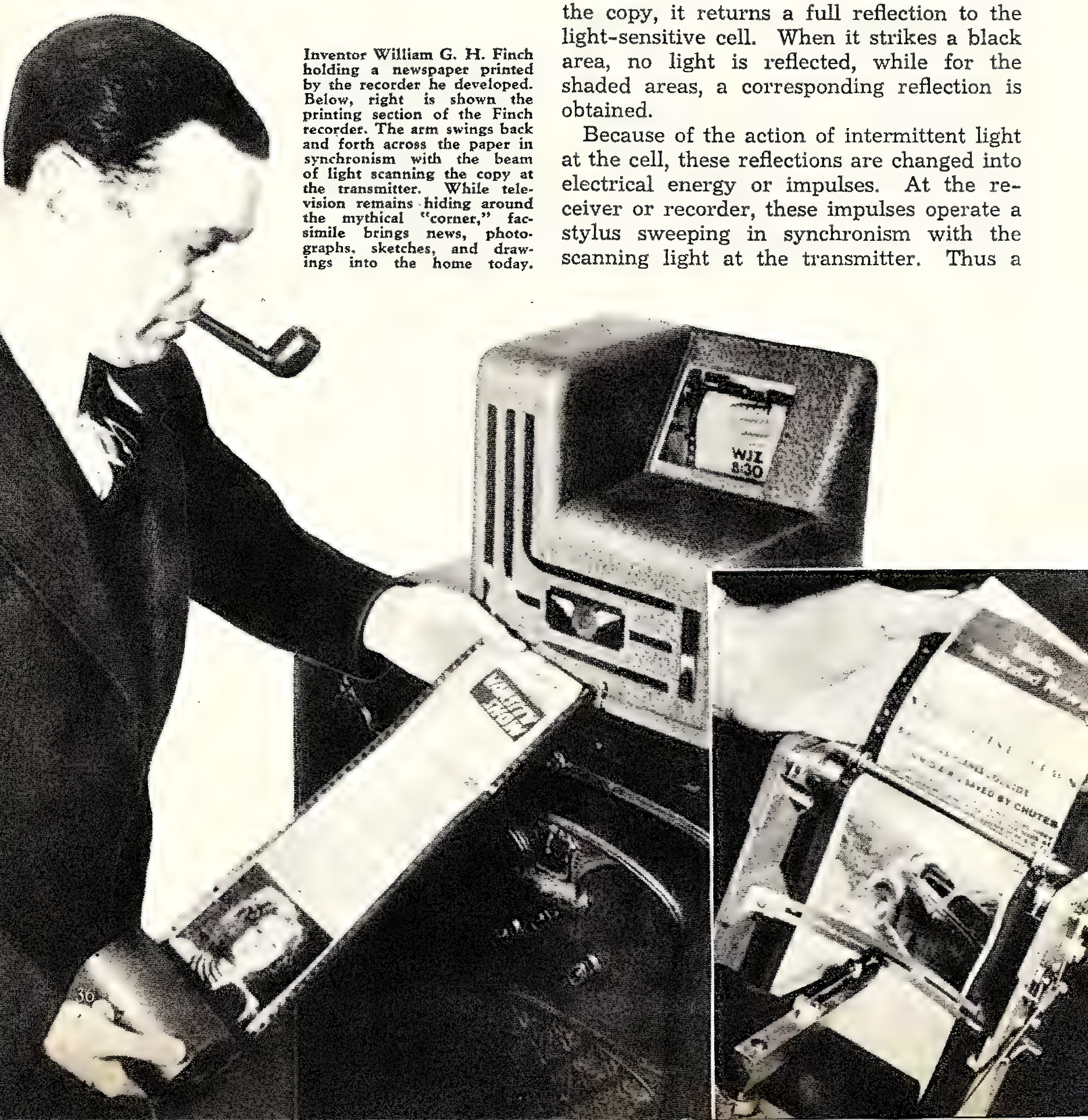
Chicago; KSD, St. Louis; WHO, Des Moines; WGH, Norfolk, Va.; WHK, Cleveland; KSTP, St. Paul; KMJ, Fresno, and KFPK, Sacramento.

The facsimile recorder will be sold at a price no higher than the average good broadcast receiver. When production is increased the price is expected to be reduced to that of the average medium priced midget receiver. With the exception of the recorder, no special equipment is required except the broadcast receiver itself.

This new medium of entertainment and education is not to be confused with television, differing most widely from it in that its operation produces a tangible newspaper on which appears the printed word, photographs, drawings, sketches and even advertisements. As the newspaper is produced, it can be removed from the machine and preserved if desired, differing from the conventional type only in size.

Briefly, the operation of the transmitter and recorder is as follows: The copy to be transmitted—whether it is pictures, news flashes, line drawings or comic strips—involves no special printing or preparation because the material itself can be inserted directly into the transmitter. An electric bulb, throwing a spot of light, moves back and forth across the copy to be transmitted. This action is similar to that of the human eye as it sweeps from left to right across a line of type. In its movement across the copy, the spot of light is reflected back into a light-sensitive photo-electric cell. When the scanning light strikes the white portions of the copy, it returns a full reflection to the light-sensitive cell. When it strikes a black area, no light is reflected, while for the shaded areas, a corresponding reflection is obtained.

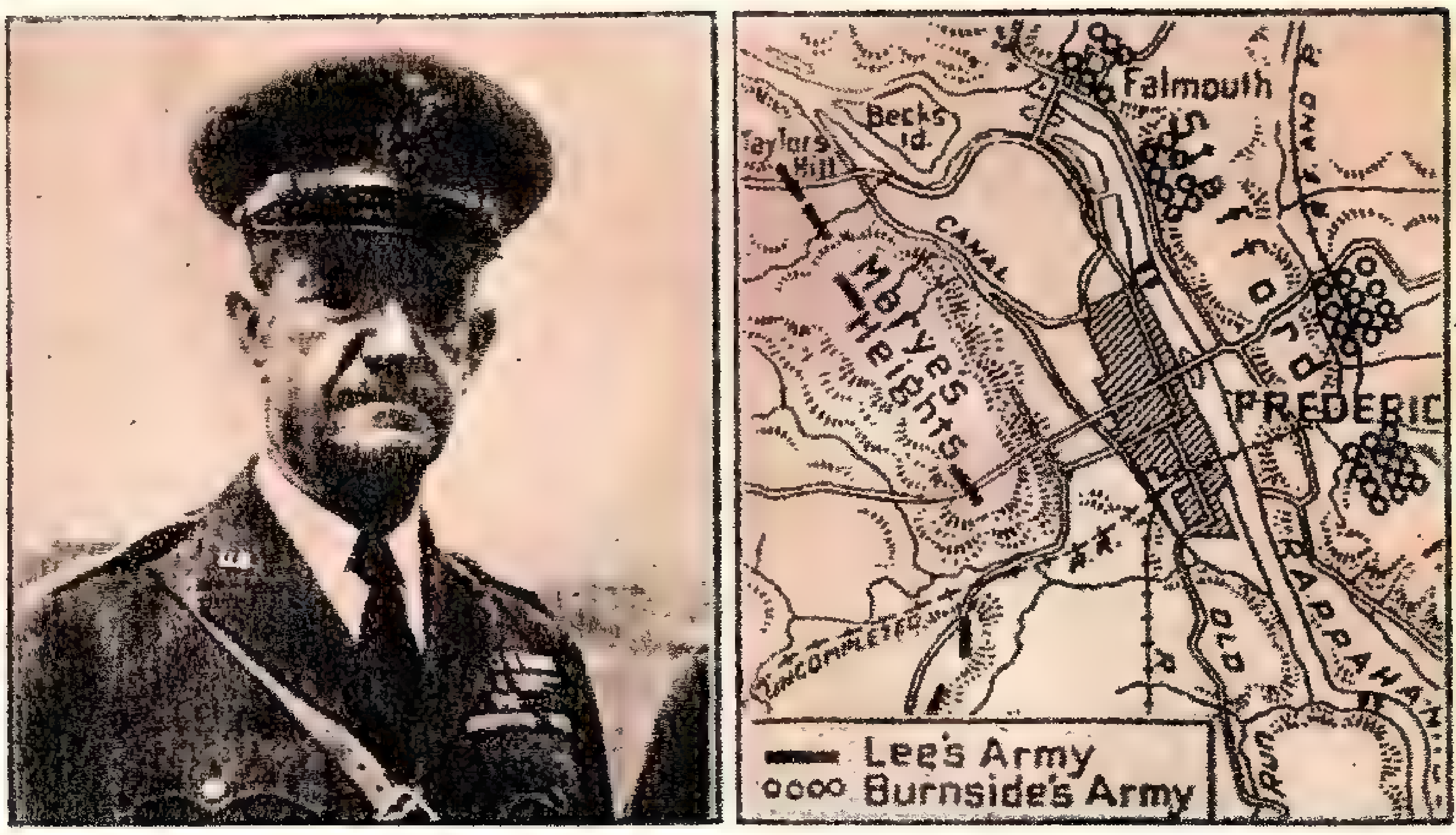
Because of the action of intermittent light at the cell, these reflections are changed into electrical energy or impulses. At the receiver or recorder, these impulses operate a stylus sweeping in synchronism with the scanning light at the transmitter. Thus a



Inventor William G. H. Finch holding a newspaper printed by the recorder he developed. Below, right is shown the printing section of the Finch recorder. The arm swings back and forth across the paper in synchronism with the beam of light scanning the copy at the transmitter. While television remains hiding around the mythical "corner," facsimile brings news, photographs, sketches, and drawings into the home today.

"black" impulse will cause the stylus to make a black mark on the paper while a "white" impulse will not cause a mark.

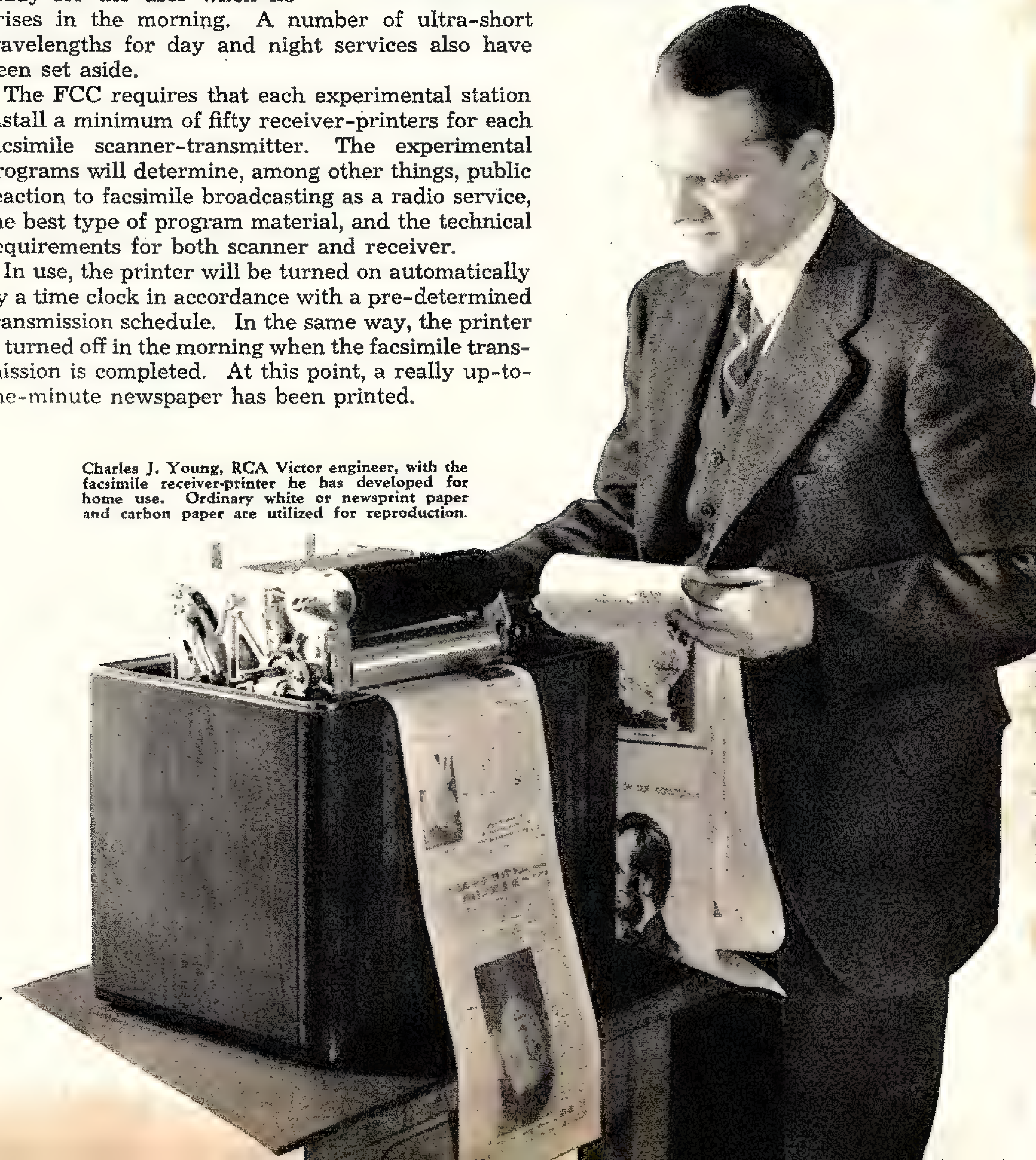
Radio facsimile service, as it is being considered by broadcasters, probably will supplement existing sound broadcast programs. It is planned that pictures and text will be broadcast on standard broadcast wavelengths during the early morning hours, between midnight and dawn, so that a complete bulletin will be ready for the user when he arises in the morning. A number of ultra-short wavelengths for day and night services also have been set aside.



Here are examples of pictures and maps produced by the RCA facsimile recorder. Although facsimile had been used experimentally by the army, it had never been adopted for regular use. In time of war, small portable receivers and recorders could supply maps to widely separated groups at the same time.

The FCC requires that each experimental station install a minimum of fifty receiver-printers for each facsimile scanner-transmitter. The experimental programs will determine, among other things, public reaction to facsimile broadcasting as a radio service, the best type of program material, and the technical requirements for both scanner and receiver.

In use, the printer will be turned on automatically by a time clock in accordance with a pre-determined transmission schedule. In the same way, the printer is turned off in the morning when the facsimile transmission is completed. At this point, a really up-to-the-minute newspaper has been printed.

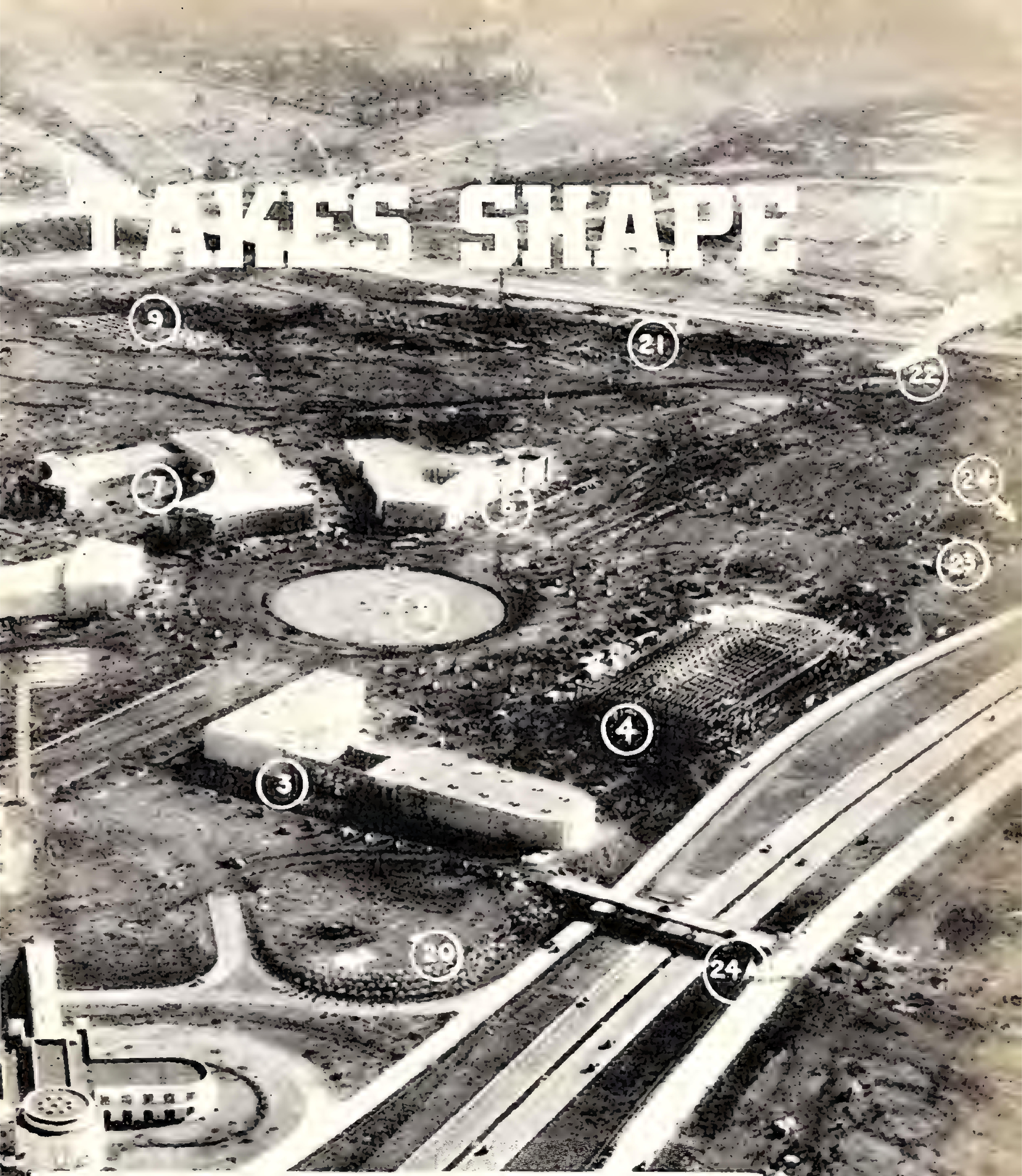


Charles J. Young, RCA Victor engineer, with the facsimile receiver-printer he has developed for home use. Ordinary white or newsprint paper and carbon paper are utilized for reproduction.

New York
WORLD'S FAIR

29
10
11
12
13
2
19
18
14
1
15
25
16
17

TAKES SHAPE



(Photo by Fairchild Aerial Survey)

Aerial view of the Central Exhibit Area, Flushing Meadow, N. Y., showing the rapid progress being made in the construction of exhibit buildings.

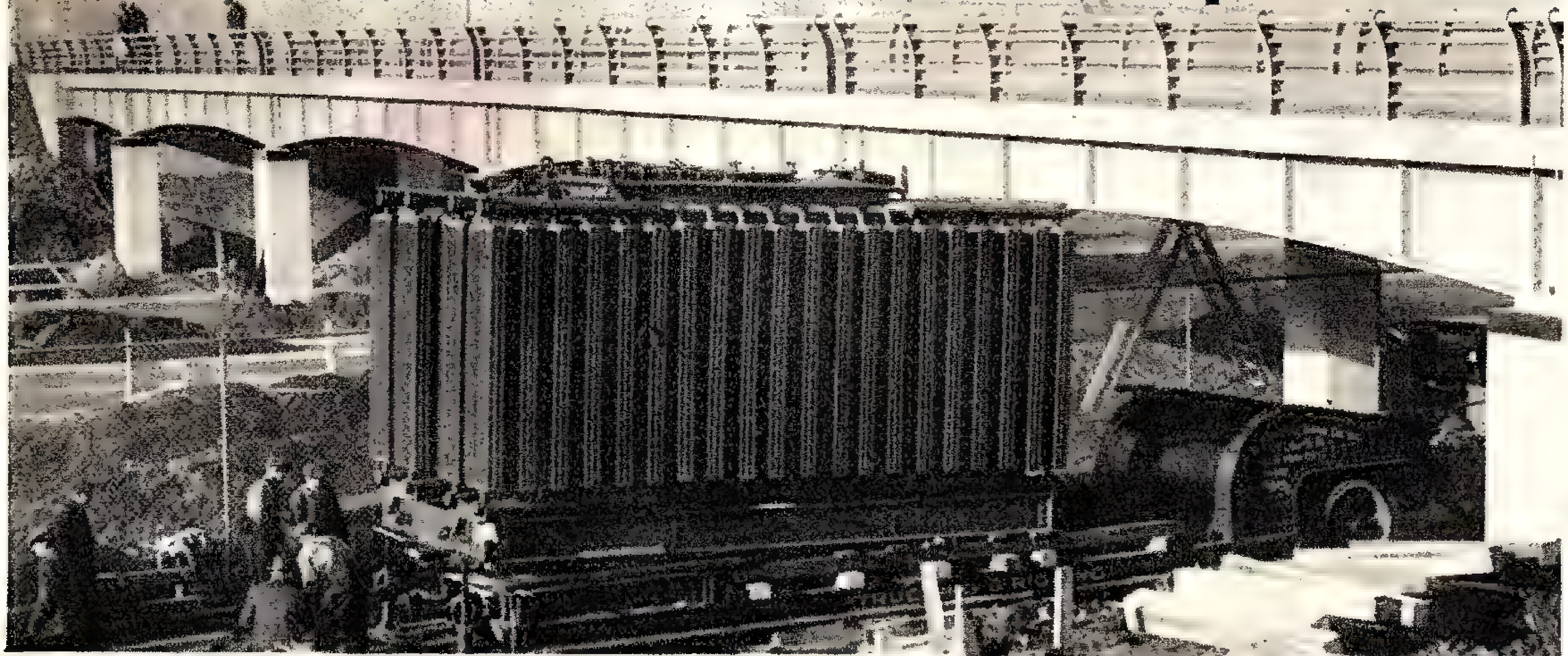
1. Administration
2. Communications
3. Business Administration
4. New York City Building
5. Theme Centre—foundations and paving for Perisphere & Trylon
6. Mining and Metallurgy
7. Consumers
8. Medicine and Public Health
9. Food—focal exhibit
10. Fisheries
11. Food
12. Shelter—focal exhibit
13. Textiles
14. Stores—warehouse
15. Utility—operations
16. Test Building
17. Employment Office
18. North Substation—power
19. Fire, Police, First-aid—Station 1
20. Field of Flags
21. Fire, Police, First-aid—Station 2
22. Empire State Bridge—over Horace Harding Boulevard
23. Beginnings, Distribution Building
24. Overpasses—Grand Central Parkway

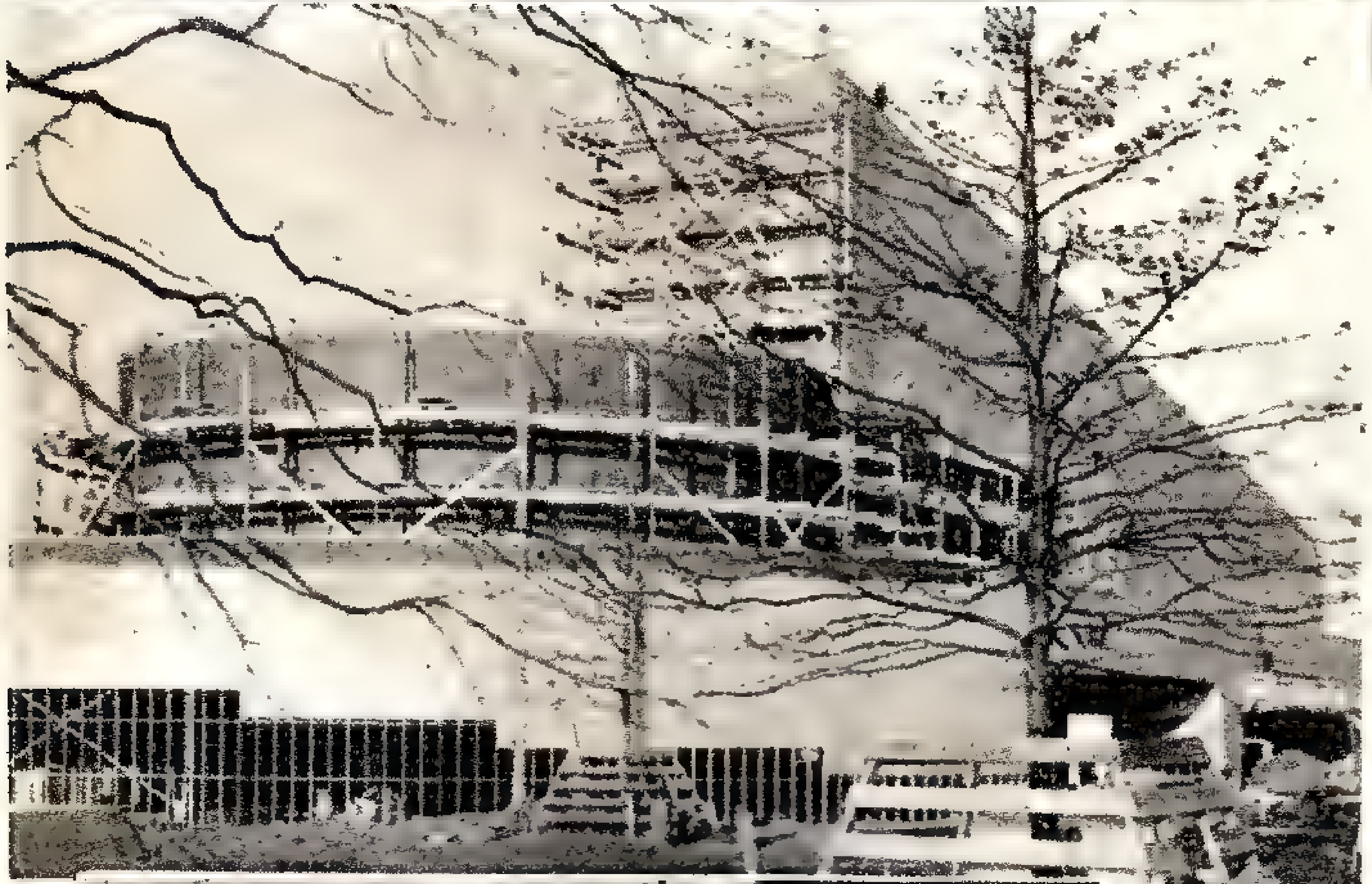
24A. Extension, new level

25. Temporary station, Long Island Railroad
26. Corner of Transportation Zone
27. North end of Amusement Zone
28. Court of States site
29. Portion of Government Zone

(Please turn to next page)

New York World's Fair Takes Shape





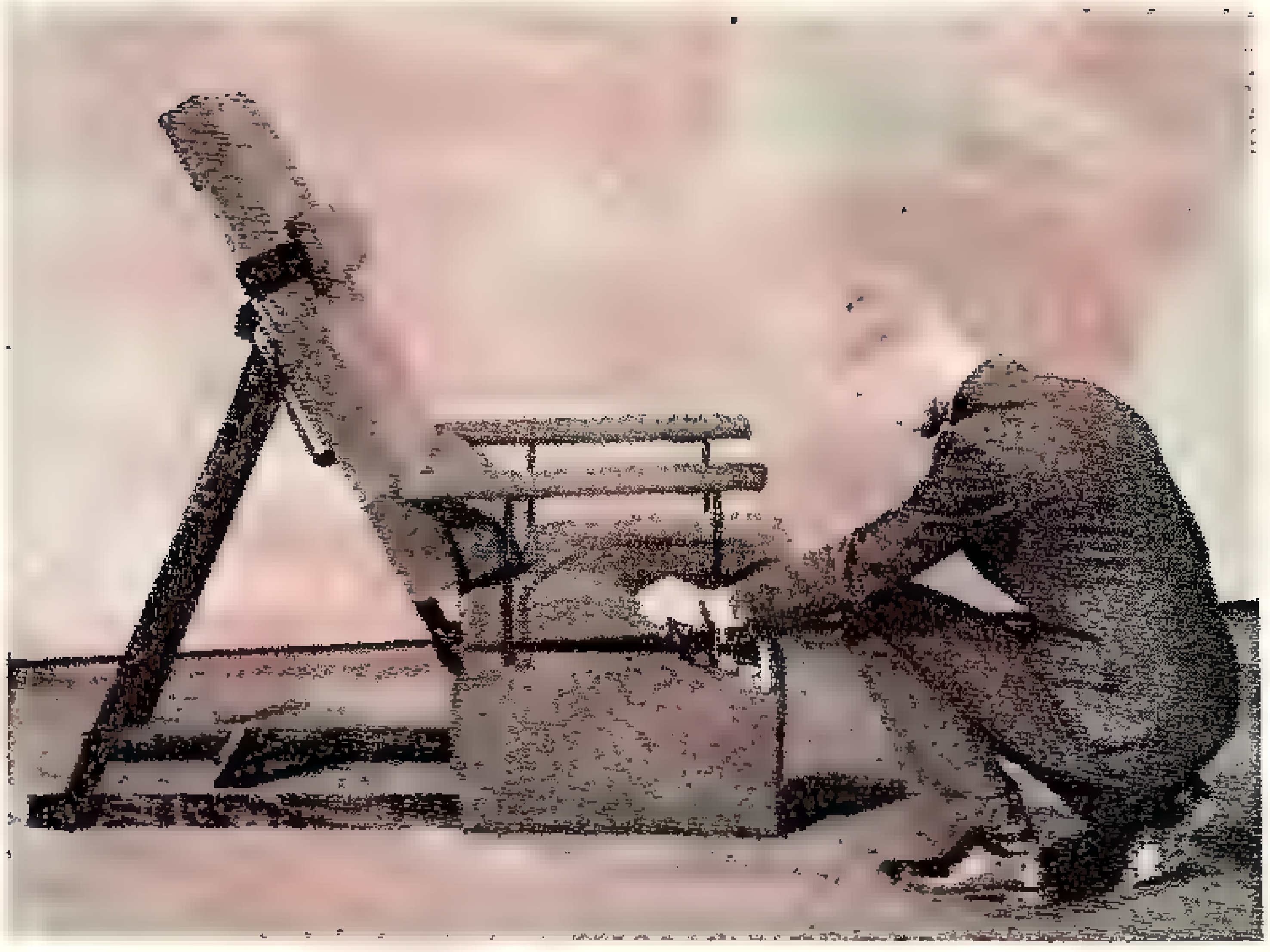
The buildings are not the only things that will attract attention. The Fair's special police force consists of men picked for their appearance as well as their ability, and their bright uniforms of military cut will catch many a feminine eye.

ALREADY ahead of schedule, work on the grounds and buildings of the New York World's Fair is progressing so rapidly that the opening of the exposition on April 30 of next year is well assured. A "face lifting" operation of gigantic scope is being performed, and visitors who will enjoy the tree-shaded promenades, the close-clipped lawns, the placid lagoons and the smooth auto roads will never suspect that for many years this was the site of the city's biggest garbage dump.

Located in the Borough of Queens, on Long Island, part of the City of New York, the Fair is only forty minutes from the center of Manhattan by a five-cent subway ride, and is the focal point of probably the greatest road, bridge and airport building program in the United States.

The fair now looks like a boom town, with workmen and supply trucks swarming all over the place. The winter of 1937-1938 was very mild, with practically no snow, so there was no delay on any of the heavy projects. Of particular interest is a $2,000,000 electric power transmission system, capable of supplying cities as large as Cleveland and Baltimore. This large installation is necessary because many of the buildings will be windowless and will have artificial lighting and air-conditioning. The photograph at the top of this page shows one of the eight 15,000 KVA transformers, weighing 56 tons apiece, which will provide the needed electricity.

Modernistic to the last degree, the various exhibit halls will produce many a gasp from visitors. Bold treatment of shapes and colors will be evident everywhere, emphasizing the Fair's theme—"Building the World of Tomorrow." At the left is a view of the Textile Building in process of construction, a sample of the unusual design that dominates the architectural planning.

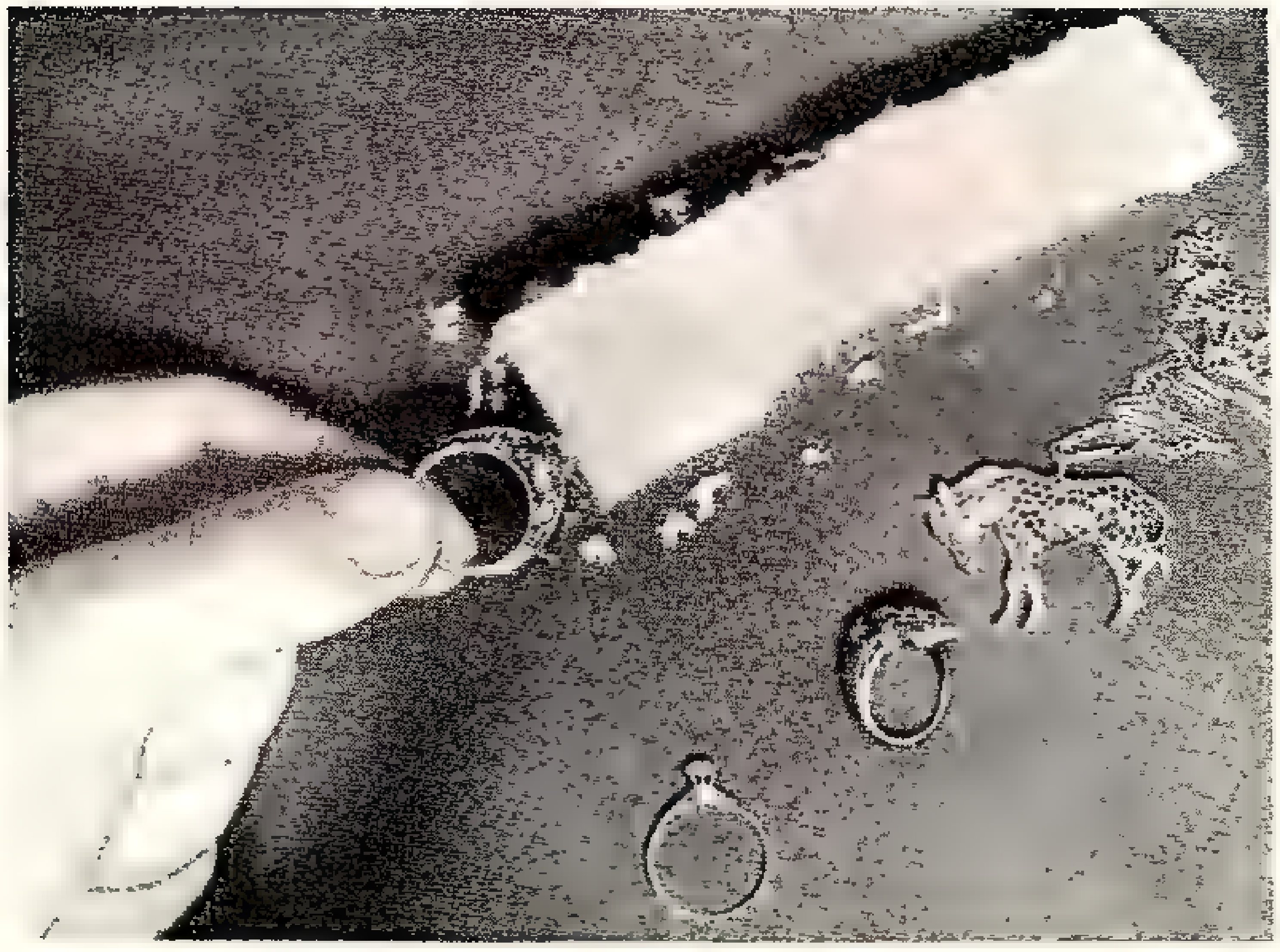


Test Chair Gauges Comfort

DEVELOPED to help furniture designers determine the best angle at which chair backs and seats should be constructed to provide maximum comfort, a mechanically adjustable posture-measuring chair has calibrated indicators showing the angle of the back, the height of the head-rest and the depth of the seat. By seating thousands of visitors at the winter furniture markets, and adjusting the chair until each claimed it comfortable, furniture designers have been able to determine the specifications for a series of three comfortable chairs.

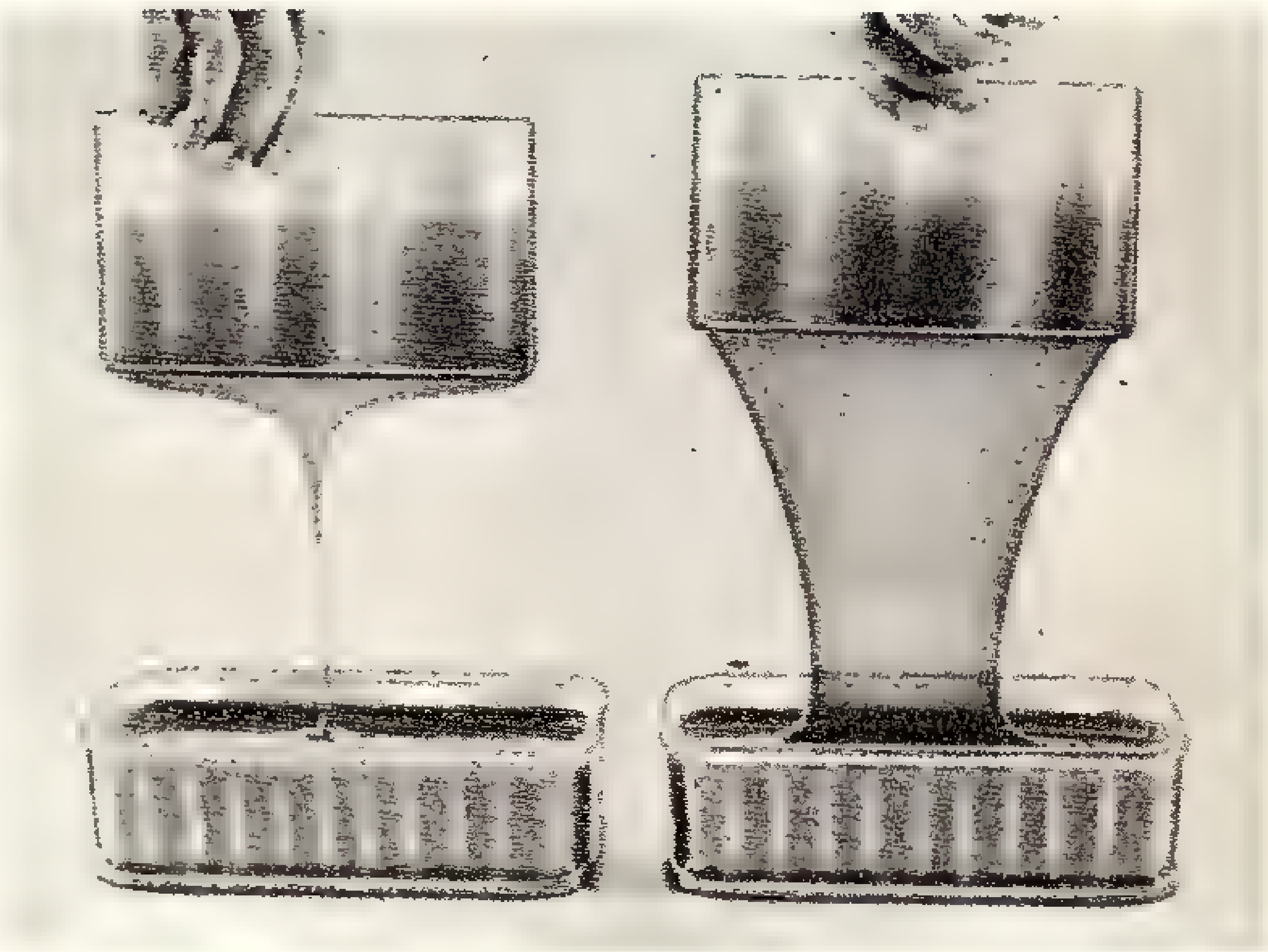
Wrist Magnet Is Beauty Aid

SPECIALLY developed for the use of beauty parlor operators, a small but powerful magnet, which is mounted on a leather wrist strap, provides a convenient means of holding hair pins in an easily accessible position while dressing a customer's hair. Available commercially, the wrist magnet has also proved to be a valuable aid to carpenters, upholsterers, dressmakers and other workers who handle pins, nails, tacks or brads. The magnet is about one-half inch thick with a diameter equal to that of the average wrist watch, thus avoiding bulkiness.



False Gems Easily Detected

ACCORDING to Samuel G. Gordon, associate curator of minerology at the Academy of Natural Sciences in Philadelphia, Pa., imitation gems can quickly be detected by means of a simple test that can be conducted in the home. The suspected gem is merely held against a chunk of dry ice and if the gem is genuine, a sharp crackling sound will be heard; otherwise—silence.



Process Reinforces Oil Film

A NEWLY developed polymerization process is said to increase the film strength of mineral oil 40 to 60 per cent, making the oil practically spatter-proof. The process, which can be applied to all types of mineral oils effects a complete change in the oil molecules without changing the chemical content. The photo above shows untreated and treated oil, respectively.

U. S. NEEDS PLANES and MEN

by
Brigadier General
H. H. Arnold,

Assistant Chief of the Air Corps, U. S. Army

Clarifying a maze of claims and counter-claims, Brigadier General Arnold evaluates the Air Corps.

No "swivel chair" pilot, but a real flying officer is Brigadier General H. H. Arnold, above.

WAR stalks abroad in more than one unhappy land today. The threat of war is immediate and sleep-disturbing in some other nations not now actually engaged. Armaments, land, sea, and air are being built up with unprecedented acceleration in every corner of the earth. One new note, one recent trend, is distinctly discernable in the present arms race not apparent in any of those which have gone before; that is the greater emphasis on air forces and their equipment. A distinguished military authority recently pointed out that England, Germany and Italy at least, of the world powers, were spending more of their rearmament funds on aviation material than on either their armies or their navies.

At such a time it may not be amiss to take stock of our own air arm, to examine critically and carefully the state of effectiveness of our own Air Force. "Is our military aviation," well may the patriotic taxpayer ask, "equipped, trained and qualified to guard our sky frontiers?" Let us make a searching appraisal, looking toward a fair answer to this timely and much debated query.

In times past many writers and public speakers have deprecated the low standing of the United States among the world air powers. There has been much chiding and berating of our national fathers because of our so-called decadent air defenses. It was quite a shock to such critics recently, therefore, when no less an authority than Jane's in its annual work, "All the World's Aircraft," made the following statement about military aviation in this country:

"The United States has one of the biggest and possibly the most efficiently armed air services in the world."

There represented are the two extremes to the question. As usual, somewhere in between lies the true answer. Here it is as I

The newly developed twin-engined Curtiss Y1A-18 mid-wing plane (above) represents a startling change in attack plane design.

Performance figures are still a military secret, but 13 of these P-37 single-seater fighting planes (right) have been ordered by Army Air Corps.

Designed primarily for attack tactics against huge bombing planes, the Bell "Airacuda" pusher-type fighting plane is armed with six machine guns.

see it. First, for a statement of the measurements by which we compare air forces. Their effectiveness depends upon a number of constituent ingredients. These are:

Airplanes: number, type, characteristics, accessory equipment.

Operating crews: number, type, and state of training—pilots, gunners, bombers, navigators, radio men.

Maintenance crews: number, state of training of maintenance men, for servicing, repair and overhaul of planes and engines.

Air bases: flying fields, shops, hangars, barracks, safe harbors for machines and men.

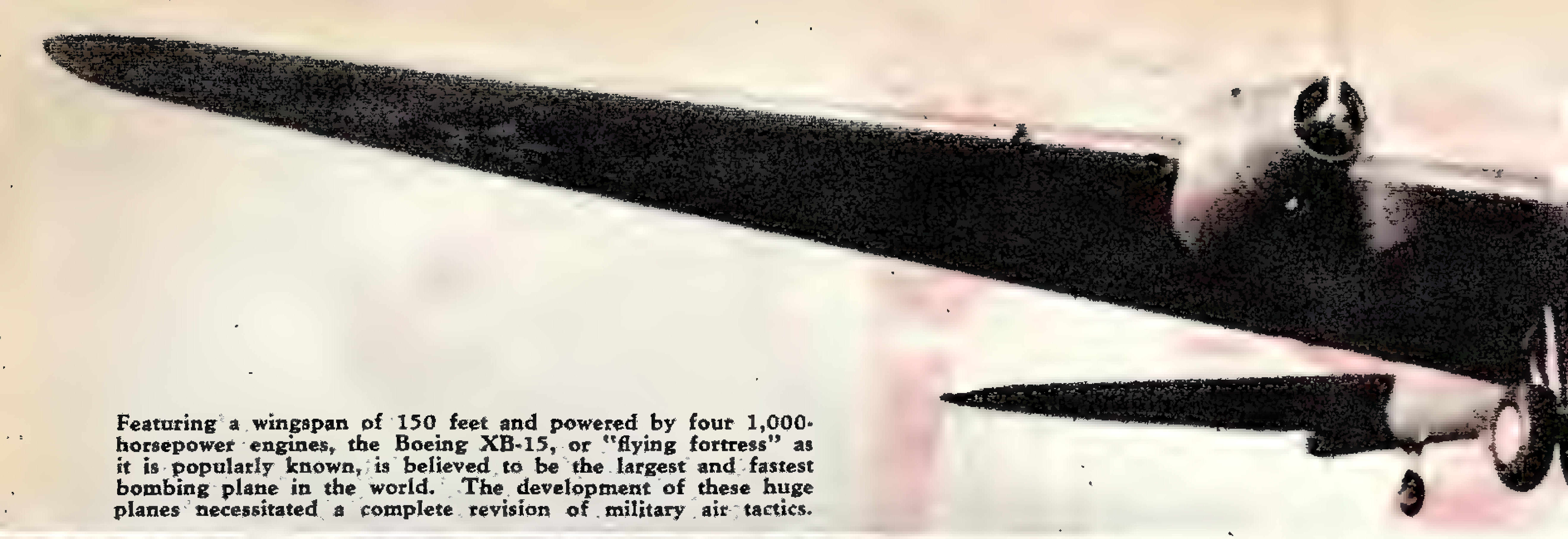
The state of the aircraft industry: how rapidly can reinforcements and replacements be supplied? What are the resources in raw material and personnel recruiting available?

Probable missions: Geographical location, isolation, probable adversaries, probable allies — war plans.

There you have the constituent variables—machines, men, bases, resources, missions — by these yardsticks shall we judge Air Forces.

We have more than one thousand modern fighting planes in our Army Air Corps, divided into the type categories, pursuit or fighters, bombers, attack, and reconnoissance and observation. These planes, type for type, are the equal of those found elsewhere in every case, and in several types we are distinctly superior to those possessed in quantity by any of the other leading air powers.

In this connection a word of warning is well sounded. Our present favorable position in airplane and engine development is



Featuring a wingspan of 150 feet and powered by four 1,000-horsepower engines, the Boeing XB-15, or "flying fortress" as it is popularly known, is believed to be the largest and fastest bombing plane in the world. The development of these huge planes necessitated a complete revision of military air tactics.

Piloting is only one phase of the intensive training of a modern military flyer. Shown above is a cadet class at Randolph Field, Texas, practicing radio transmitting and receiving, or "buzzer" as it is termed by the student pilots, the messages being sent in dot-dash code.

Airplanes can't fly unless trained ground crews keep them in first class condition, so Uncle Sam trains mechanics, too (above).

due primarily to the funds and effort we have expended during the past twenty years in fundamental research and experimental engineering. During the years since the war, we in this country, the army, navy, National Advisory Committee for Aeronautics, Bureau of Air Commerce, and aeronautical industry combined to spend more money on fundamental research and aeronautical experimentation than any of the other nations. During the past year there has been ample evidence that several of the other powers realize fully the reason for our favorable position, for some of them are now expending vast sums on wind tunnels, experimental laboratories and engineering establishments. In three to five years, therefore, we may well expect, in fact it is a foregone conclusion, that these nations will surpass us in airplane excellence and performance. The only alternative is for us in this country to bestir ourselves and increase by at least one-half, and preferably double, our funds, resources and effort in aeronautical experimentation and research.

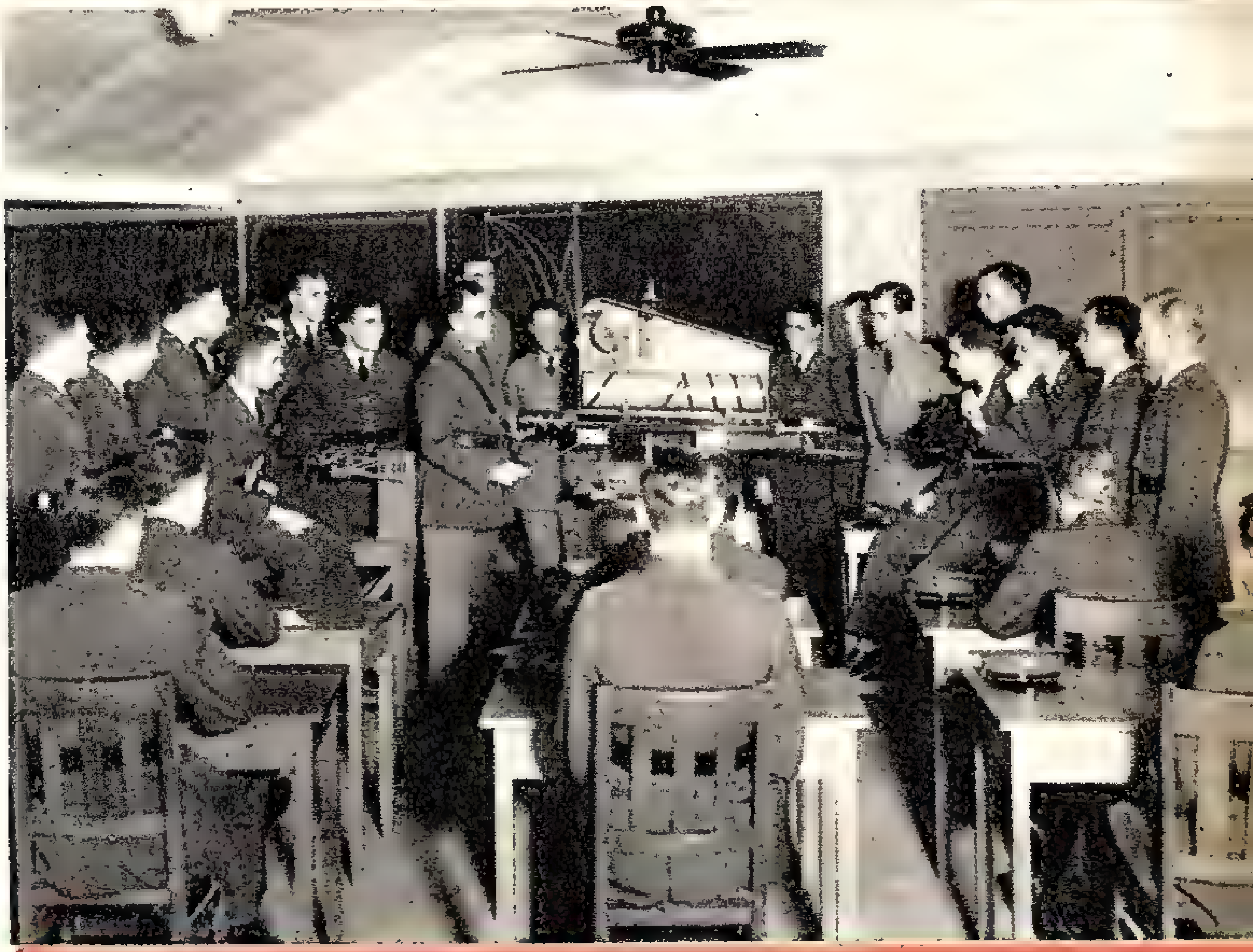
Today, however, our position is an enviable one. Our newer planes surpass, for the purpose for which designed, the prototypes found elsewhere. There is not a four-engined, long range, high performance, high capacity bomber abroad which its owners would not gladly exchange for our "Flying Fortress," the Boeing bomber. There is not a

fighter in any land which has created the stir and been accorded the adulation and praise heaped on our Bell "Airacuda," multi-seater fighter, the world over. Our attack planes, of which the Northrop is the single engined version and the Curtiss A-18 the twin engine prototype, are preeminent in their fields. Our single seater fighters, Seversky P-35 and Curtiss P-36, are excellent pursuit planes. Some fighters may be found abroad slightly faster, but few, if any, possess all the many characteristics, many of them antagonistic the one with the other, as are combined into these sleek, little, metal air destroyers.

On the score of total numbers of military aircraft, five or six of the nations of the world exceed the United States, but we take no small comfort that on the score of quality and unit effectiveness, there is little question but that we go to the head of the class.

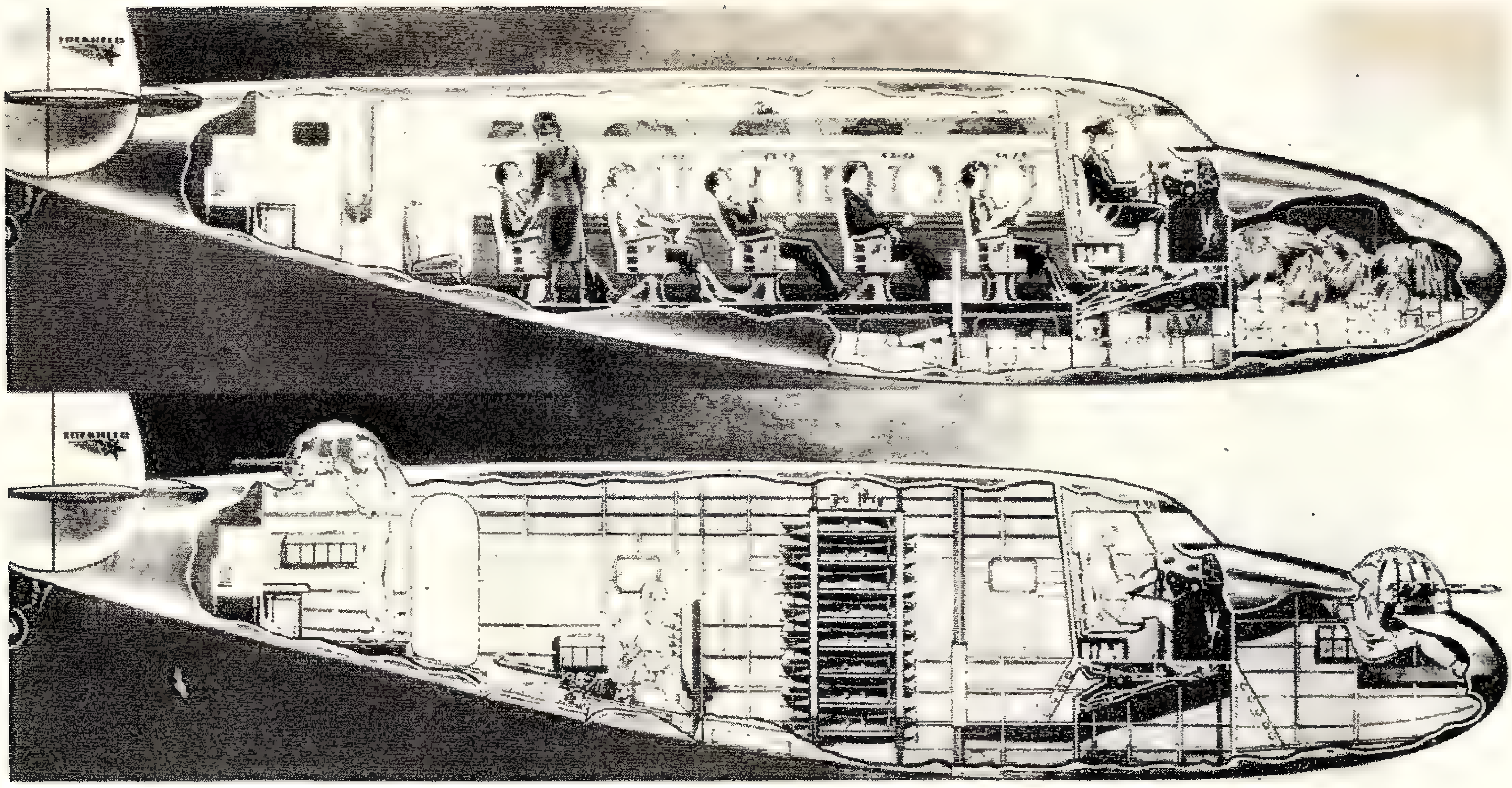
Air bases comprise an absolutely essential element in any effective air force. The finest planes in the world will be mired in the mud, inert and useless when needed, if proper bases are not available from which they can be cast into the air, groomed, manned, tuned up and armed for effective fighting might.

Millions of dollars have been spent by the Army during the past few years in an effort to provide up-to-date air bases. There has been much improvement in living conditions for officers and men; shops, hangars,



The "ground school" training of future Air Corps pilots involves attendance at lectures devoted to photography, navigation, aerodynamics and a score of allied subjects. Shown above is a class attending a lecture on the operation of various aerial bomb sights.

A class in soldering and brazing technique at the Air Corps Technical School, Chanute Field, Ill., is shown in photograph above.



Many modern commercial airplanes are so designed that they can easily and quickly be converted into bombing planes in event of war. The cross-section sketches above show conversion of Lockheed transport.

runways and gasoline and oil storage have been provided at many regular army flying fields. Notable illustrations of recent effort now in progress may be seen in the new Northwest Air Base, McChord Field, Tacoma, Washington, and Hickam Field, Hawaii.

Air bases are expensive installations. Funds which have been available have not permitted simultaneous completion of all our needed bases, but work has progressed as rapidly as budget limitation would permit. There is every evidence that our present plans will progress to steady fruition, to the end that we shall have within five years adequate air bases well located and suitably equipped for the defense of the nation.

Now for a consideration of our standing concerning men, operating and maintenance crews, their training discipline, numerical strength and general effectiveness.

Regrettably, we are weakest on the personnel side so far as numbers of pilots and combat crewmen are concerned. We are short several hundred trained airplane pilots properly to man the planes now nearing completion. Our War Department is mindful of this deficit and legislation is now pending in an effort to overcome this deficiency. Not alone have we been handicapped by lack of trained pilots in sufficient quantity, but there is a dearth also of bombers, gunners, navigators and radio men. A new branch of our technical school has but recently been opened at Lowry Field, Denver, Colorado, in an effort to supply these men in greater quantity. This is a serious problem, but it is half solved when we realize it and form plans to correct it.

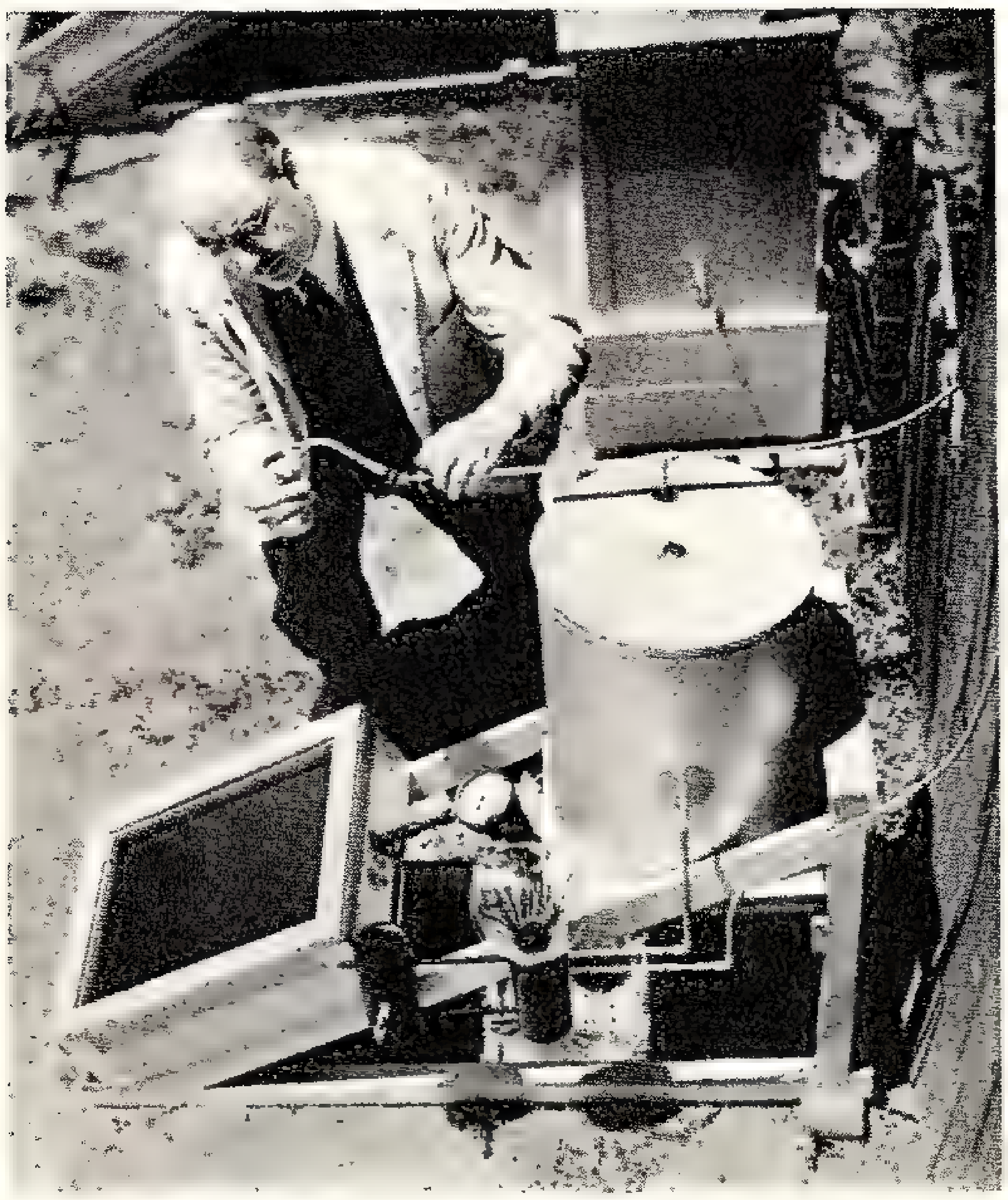
Fortunately, those men we have, thanks to the General Headquarters Air Force, are well trained; they are organized into tactical units on a sound functional basis, the tables for which have been worked out and perfected during the past year. There is not the slightest doubt in my mind that our Army Air Corps personnel, pilot, machine gunner, bomber, radio man, photographer, and navigator, man for man, is the equal if not the superior of those found anywhere in the world. Their training has not been theoretical alone; it has been tested by thousands of hours of flying, millions of rounds of live

[*Continued on page* 118]

Ready for a training flight. Pilots of a squadron of North American BT-9 basic training planes warm up their sleek "sky chariots". Note radio antennas.

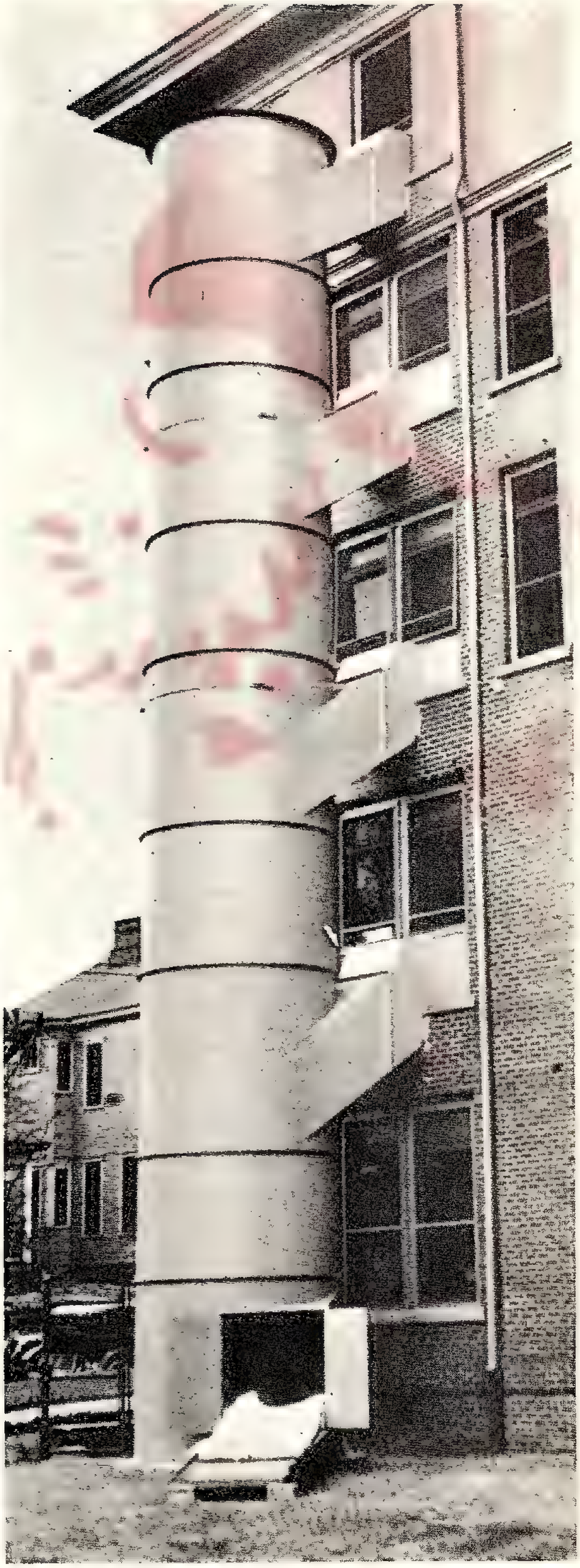
Mirror Teaches Batting

A huge mirror mounted on a wooden frame constitutes a new method whereby baseball "rookies" are taught proper batting form at the St. Louis Cardinals' winter training quarters at Orlando, Florida. Standing before the mirror, the player swings his bat and quickly improves his reflected form.



Sun Operates Gas Machine

Developed by Otto H. Mohr, of Concord, Calif., a specially constructed machine utilizes the sun's rays to produce a gas which, when broken up by means of an electric current, yields hydrogen and oxygen. The hydrogen and oxygen are then stored in separate tanks for cooking, heating, etc.

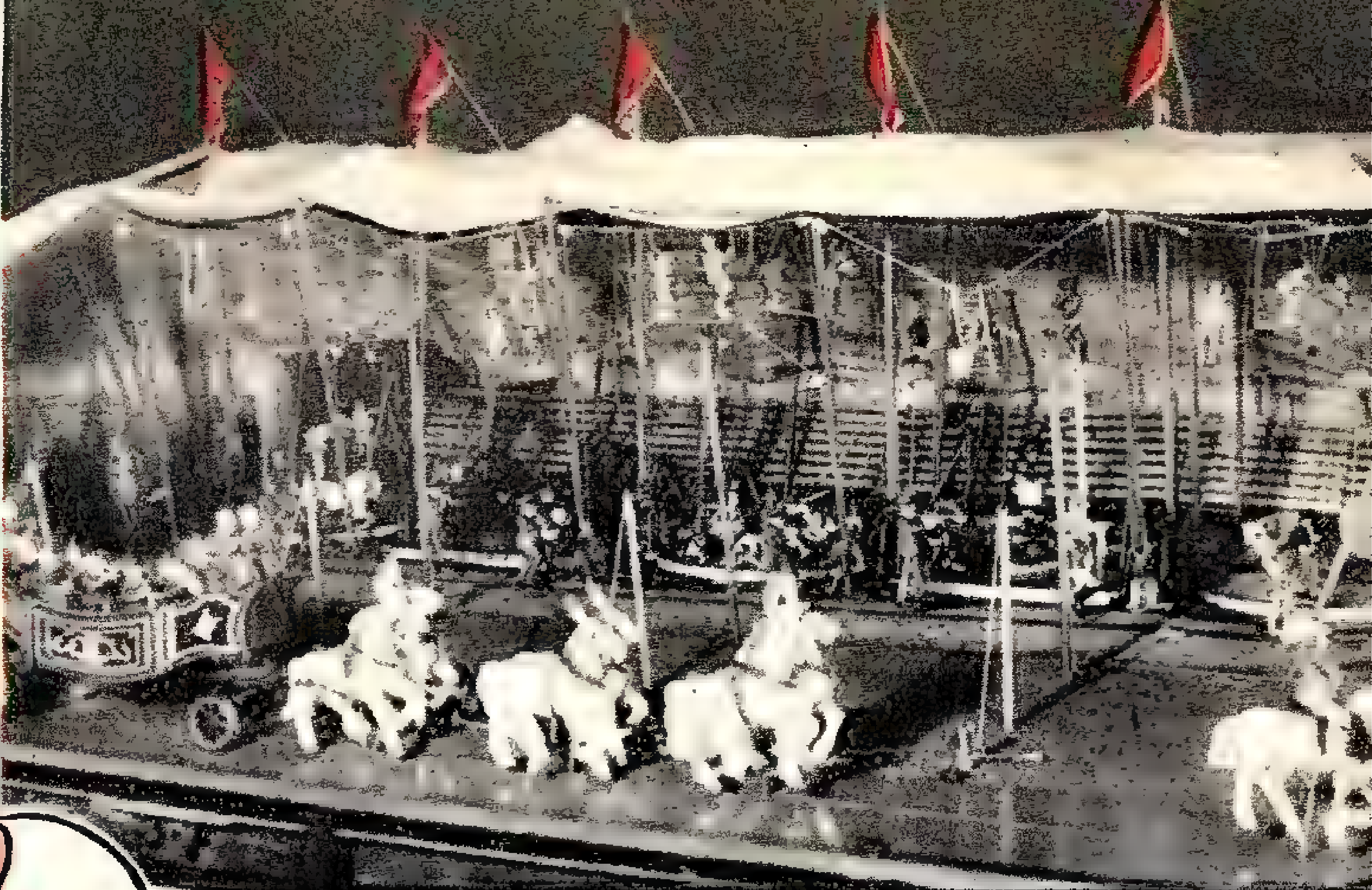


Hospital Boasts Safety Chute

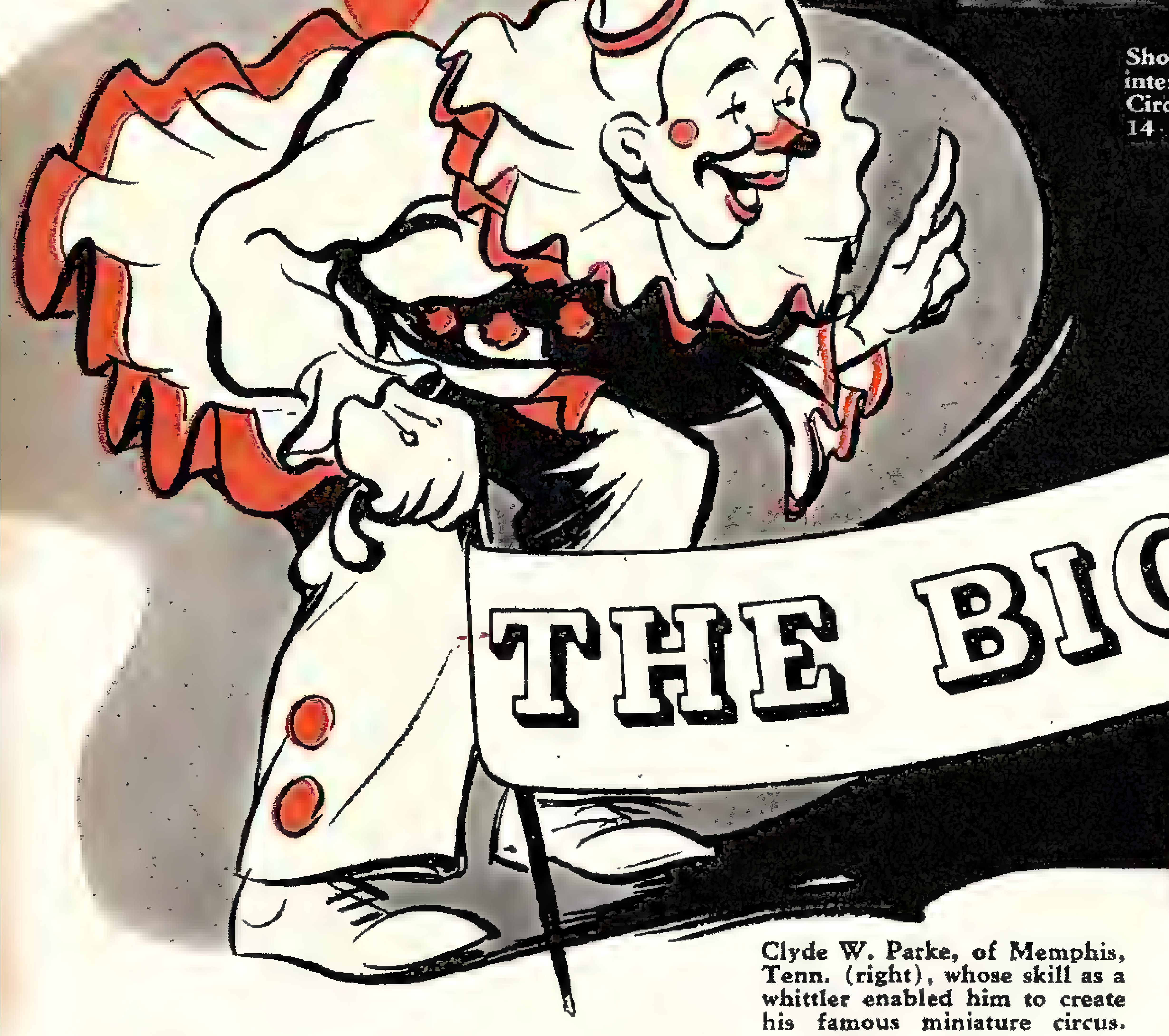
The Piedmont Hospital in Atlanta, Ga., is equipped with a spiral chute by means of which bed-ridden patients can reach the ground quickly in the event of fire. On each floor of the hospital there is an entrance to the chute and in an emergency the patients are slid down it on a mattress.

Step right up, folks, and take a peek at—

THE BIGGEST



Shown above is a section of the interior of the Parke Miniature Circus. Rings and stages are only 14 inches in diameter or square.



Clyde W. Parke, of Memphis, Tenn. (right), whose skill as a whittler enabled him to create his famous miniature circus.

FOR years, Clyde W. Parke, of Memphis, Tennessee, had been hearing the jibes and laughter of his friends as they watched him toil away with penknife and scraps of lumber. For years he had given them the same friendly smile and the same good-natured answer:

"You'll see. One of these days I'll have the greatest circus in the world!"

It wasn't a facetious remark; it was a prophesy. For today Mr. Parke is the owner of the world's most intriguing miniature circus. He is a modern Jonathan Swift, but on a more magnificent scale. Both creators of Lilliput, Mr. Parke differs from his ancient contemporary in that the creatures of his vivid imagination manifest themselves in Pigmy figures carved in wood, instead of fictionized characters.

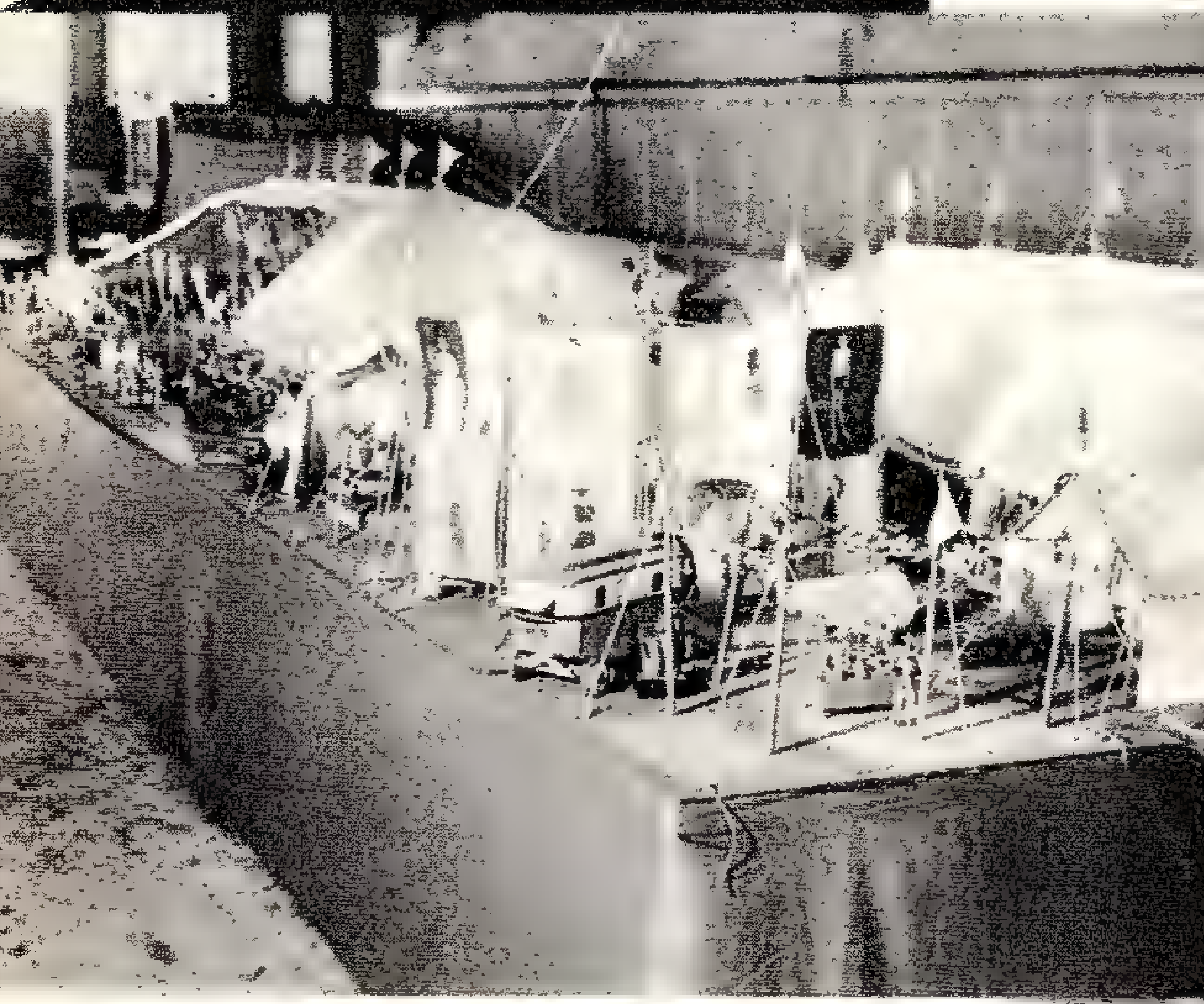
For thirteen years, beginning at the age of 37, this versatile "Master Whittler" has whittled, scraped and gouged at bits of wood. He has accomplished a gigantic feat. His "show" is not a mere collection of carved wooden "people." The Parke Miniature Circus is a vast congress of more than 300 animated lifelike actors and animals, each of which *does* something different. Every thrilling stunt you have seen pulled off by daring performers in the big shows is faithfully duplicated by Parke's mechanical midgets, which are whittled to the scale of one inch

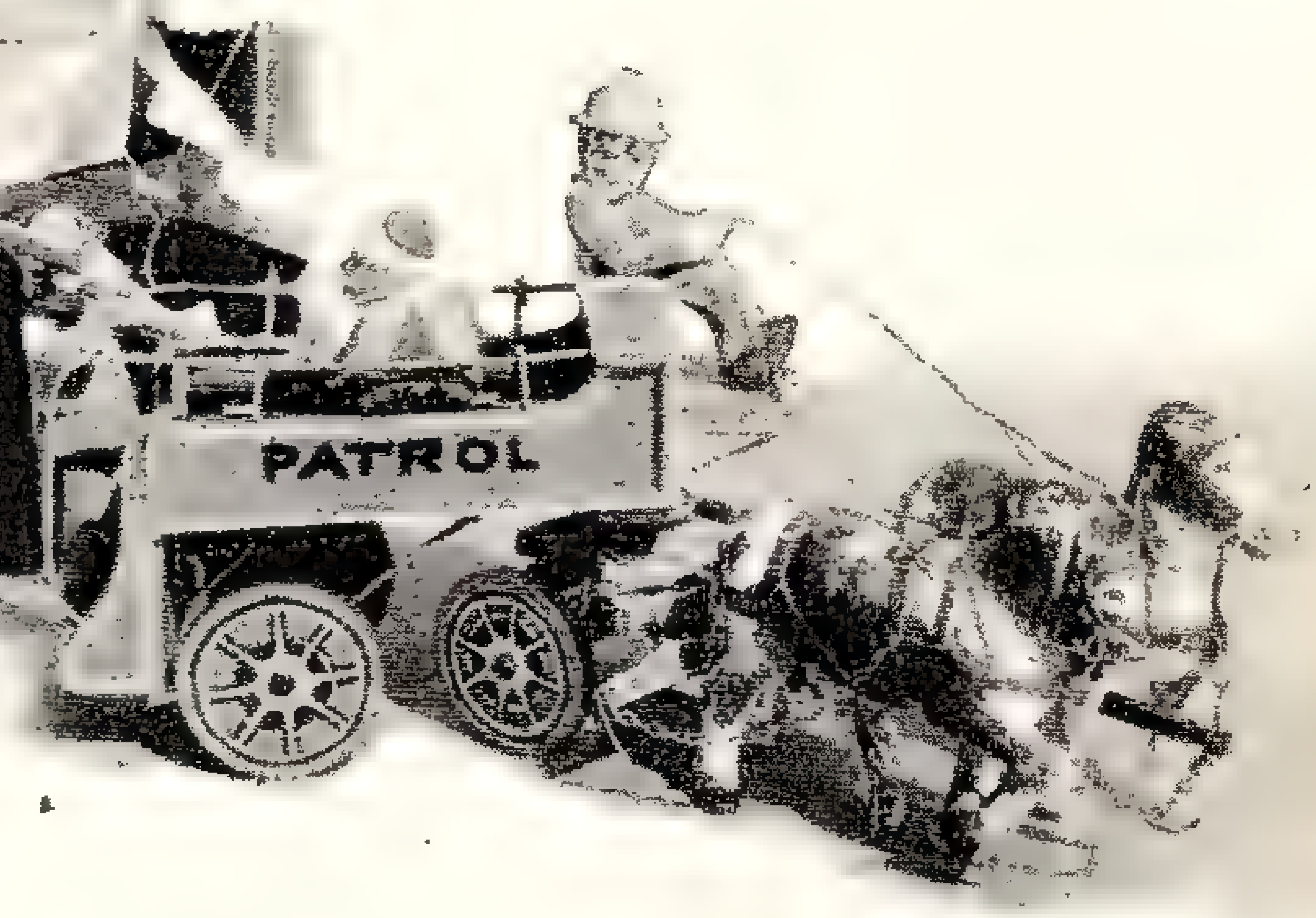
LITTLE SHOW ON EARTH

by

Robert M. Hyatt

Circle, above—One of the tiny show's floats—a Far Eastern Empress carried by slaves. Above—The menagerie tent with its animal wagons. The "Big Top" is shown in background of photo.

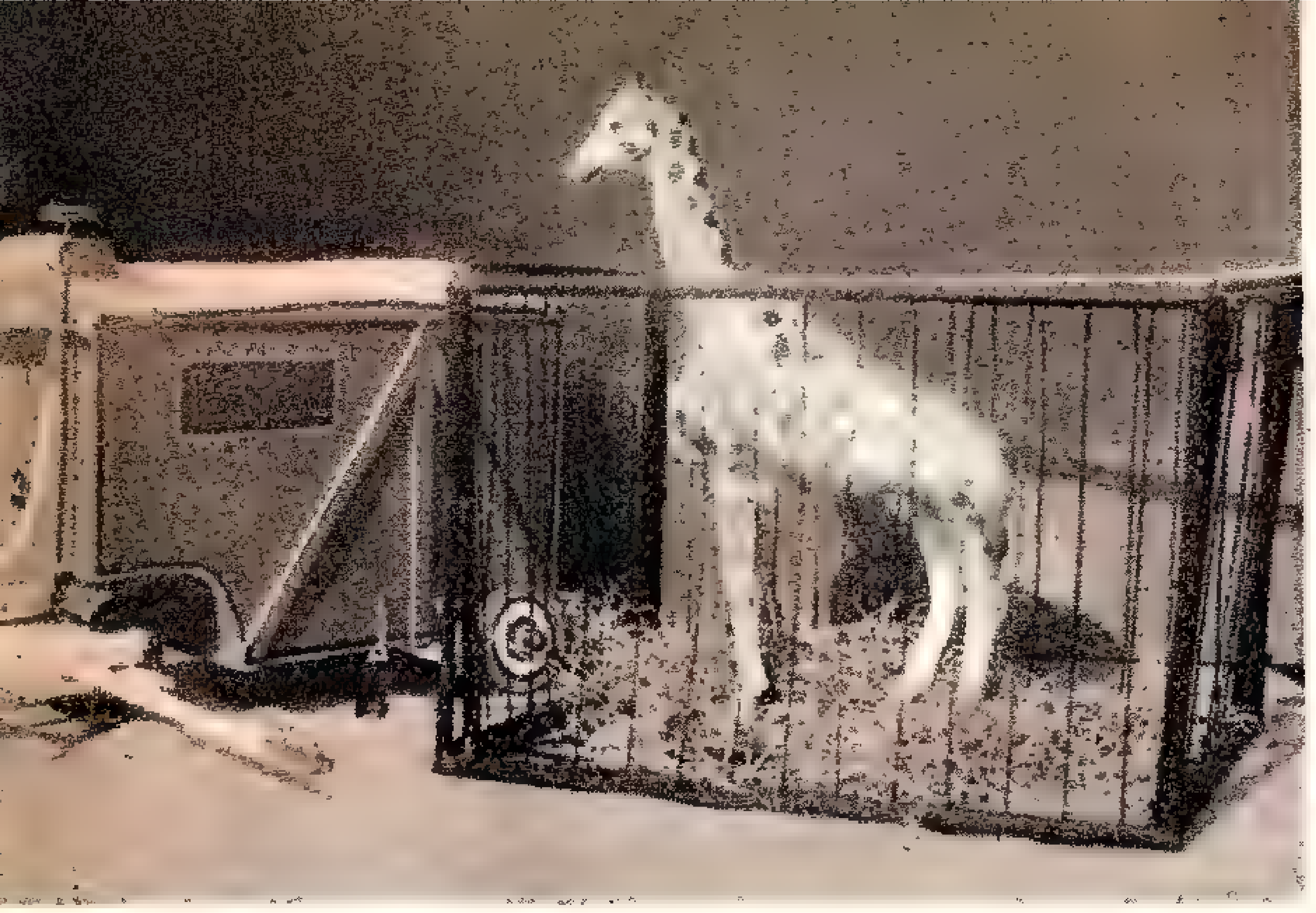




A view of the side show entrance to the miniature circus is shown above. Note the ticket wagon and ballyhoo posters. Right—A comic police patrol wagon exhibit.

to the foot. The Big Top is replete with thrills galore. There are—but wait. The best way to see a circus is to go. So step up, folks, and join the long line of eager fans buying tickets at the bright little wagon.

We have taken (in imagination) a turn about the "grounds," which are all of twenty feet long. We have had our curiosity accelerated by the antics of Firenza the Fire Eater, Stiletto the Knife Thrower, and JoJo the Dog-faced Boy. We have heard (in imagination) the husky bellowing of the barkers and spielers in front of the Side Show Tent, which is a three center-pole affair, six feet long, aflutter with gay banners advertising the wonderous sights to be seen inside. We have watched, goggle-eyed, the Sword



Boasting a height of 18 inches, the giraffe realistically looks over the top of his cage.

Swallower gulp a wicked looking blade; the Magician produce a squirming rabbit from nowhere; the Fan Dancer in seductive wiggles; and the Snake Charmer slithering amongst her venomous charges.

With bursting curiosity we line up to get inside. With the big show coming off in a few minutes, we cannot spend much time in the Side Show. After taking in the lesser spectacles here displayed, we move toward the Big Top. First, however, we must stroll through the Menagerie Tent. This is eleven by three feet in size. Around the sides are the animal cages. The center is roped off for the elephants, zebras, camels, and other large grass eaters. There is a plentiful sprinkling of straw on the floor, and here and there a tiny bale of hay. At one side of the arena a long, spotted neck topped by an ungainly head, rises above the high fence. It is the Giraffe and apparently all is well up aloft!

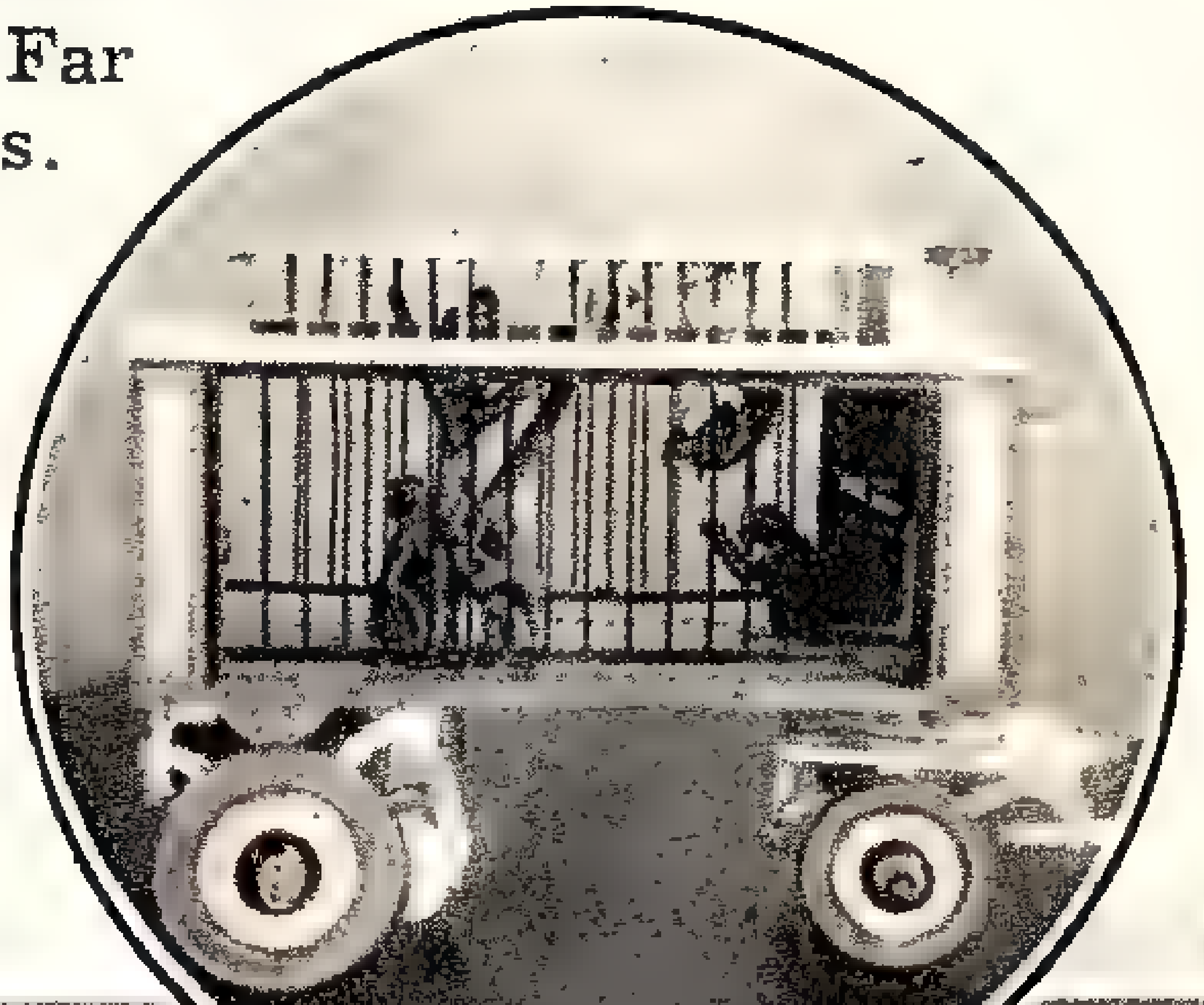
The Main Show Tent merits some description. On each side is the Reserve Seat section —eight sections of 80 seats each, with foot boards and backs. The spectators seated here are cooled by 16 midget electric fans.

At last seated (figuratively), we glance around the sparkling interior. Countless tiny ropes hold up, with the aid of block and tackle, the pole assembly of the entire tent. Our eyes are dazzled by the clusters of lights around each pole. There is the trapeze rigging, the aerial wheels, and all the paraphernalia used by the little actors. But we are not given long to indulge in these commonplace essentials. With a mighty flourish the Grand Parade enters the arena at one end of the Reserve Seat section, and all eyes focus upon this colorful display.

First into view comes six prancing white horses, drawing the band wagon resplendent in red, white, black and gold colors. The spirited, high-stepping chargers give us as much thrill as does the driver on the seat, swinging his reins and swaying his body to the mythical rhythm of the five-man orchestra behind him.

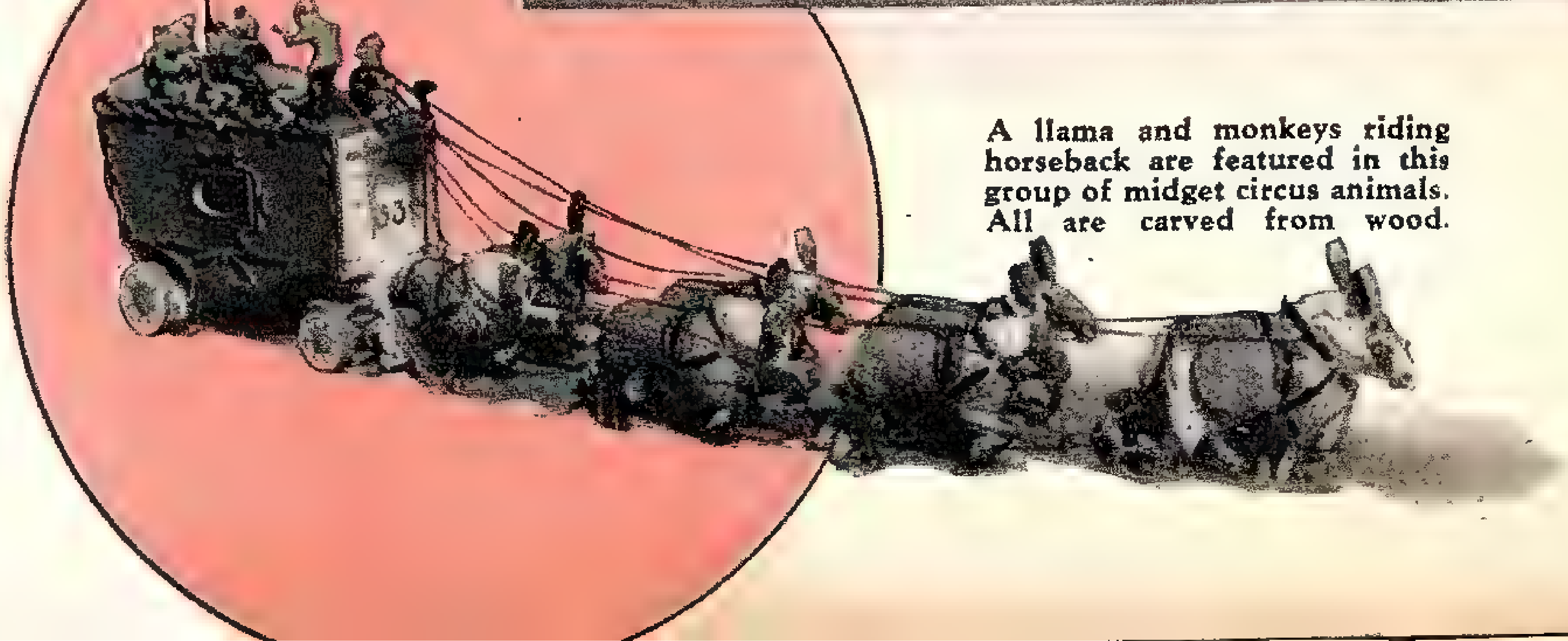
Immediately following this appears several floats. There is "Little Red Riding Hood," "Peter Pumpkin Eater" and the "Old Woman in the Shoe" with all her brood. Then the most dazzling of all the floats—Queen of Sheba, seated on her gaudy throne, surrounded by realistic fire urns, and haughtily gazing out over the backs of her six white horses. On either side and behind her stand servants dressed in white, each waving a palm fan over Her Majesty.

Still another float is that of some Far Eastern empress. She is seated on an ornate pal-



The Monkey Wagon (right) is a big favorite with spectators at the midget circus. The monkeys, skillfully carved, are shown in typical simian antics.

A llama and monkeys riding horseback are featured in this group of midget circus animals. All are carved from wood.



Eight life-like horses draw the gayly colored Band Wagon, with its rhythm-swaying musicians, as it enters the arena at the head of Grand Parade (right).

anquin borne on the backs of six stalwart Nubian slaves. At her feet crouches a snarling tigress.

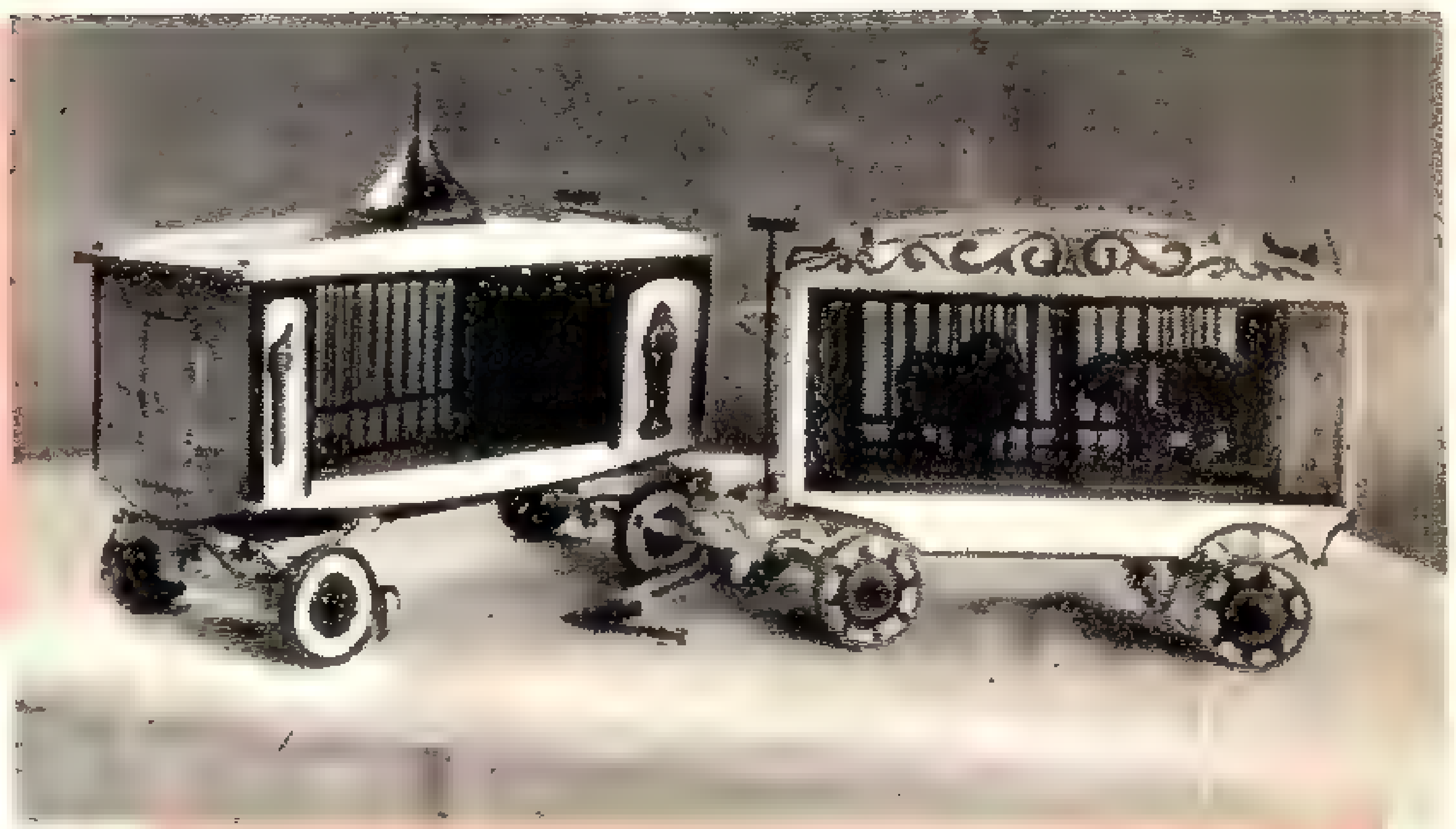
There follows the yellow and white wagon bearing a huge hippopotamus. He seems quite content even in his cramped quarters, since the bed of the wagon is composed of a tank of water (a glass top creating this illusion) where Mr. Hippo may take a dip.

The Monkey Wagon causes a howl of applause. Here several of the amusing little simians disport themselves in all the tricks known to Monkeydom.

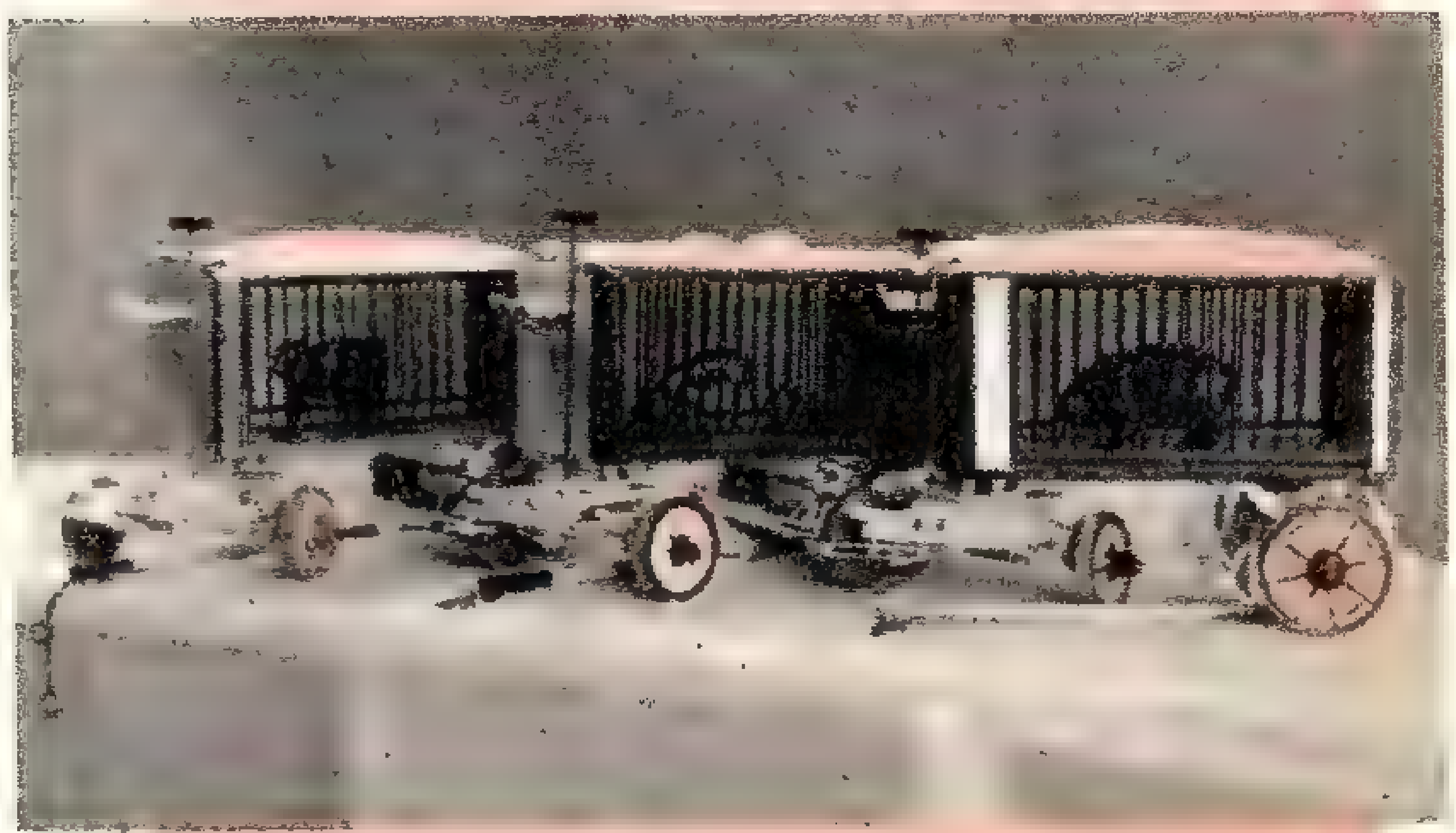
The next wagon might have arrived from Greenland. Giant icicles hang down over an icy blue background, while the roof is a replica of the flashing Aurora Borealis. Within, reclining in his proper environment of gleaming snow and icebergs, is a giant polar bear.

There is a wagon of serpents and so realistic are they that many in the audience refuse to touch even the wagon! Following this are the gorgeously bedecked wagons with lions, leopards, kangaroos, gnus, a tank of seals, black bears, and many other animals. There is a ponderous rhinoceros, one of the rarest beasts in captivity, and several gangling giraffes. Mr. Parke here calls our attention to something that may surprise many of us: The giraffe's tremendously long front legs are in reality no longer than his seemingly shorter hind ones. It is only because his shoulders are so high, causing his back to slant at a grotesque angle, that his front legs appear longer.

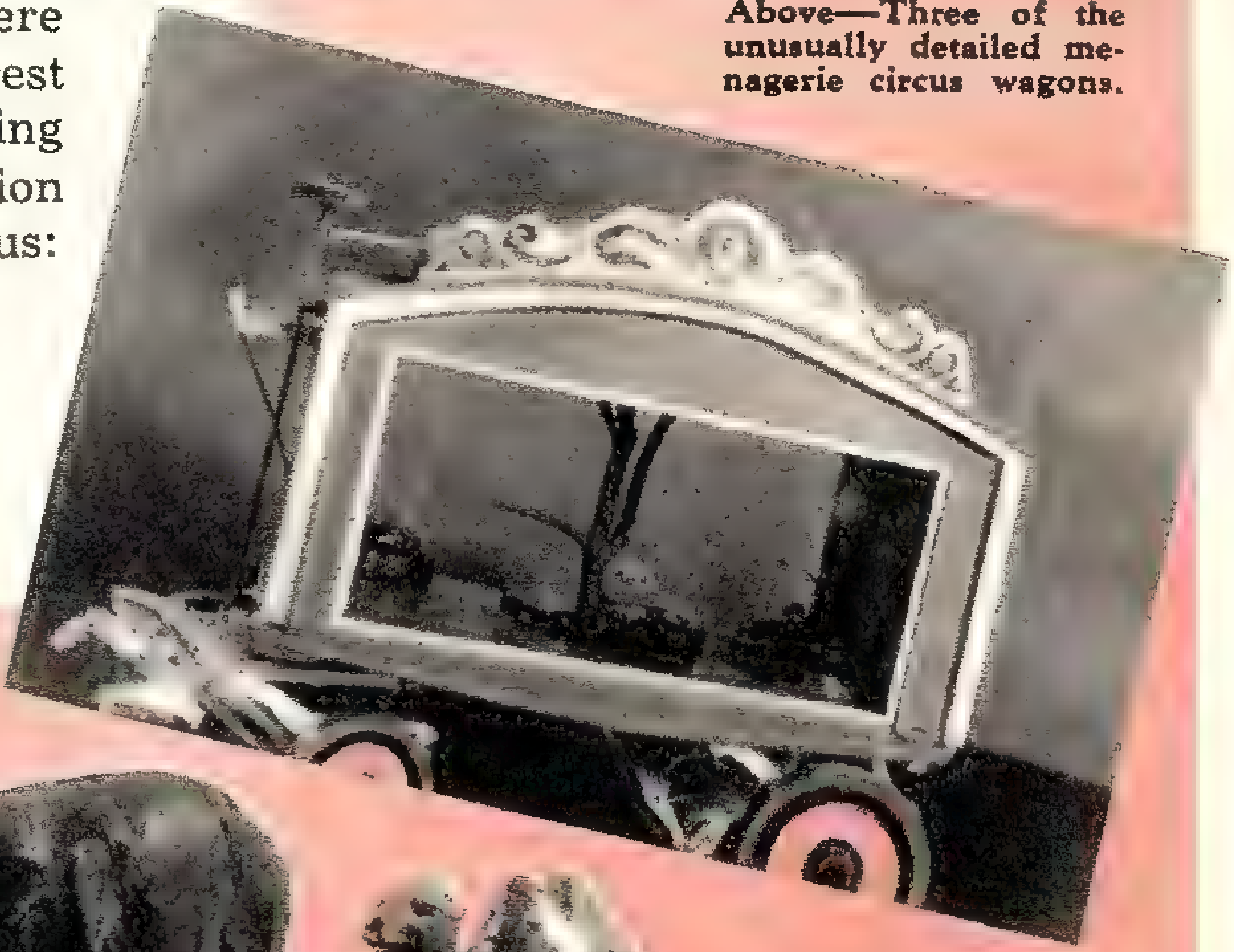
[*Continued on page* 118]



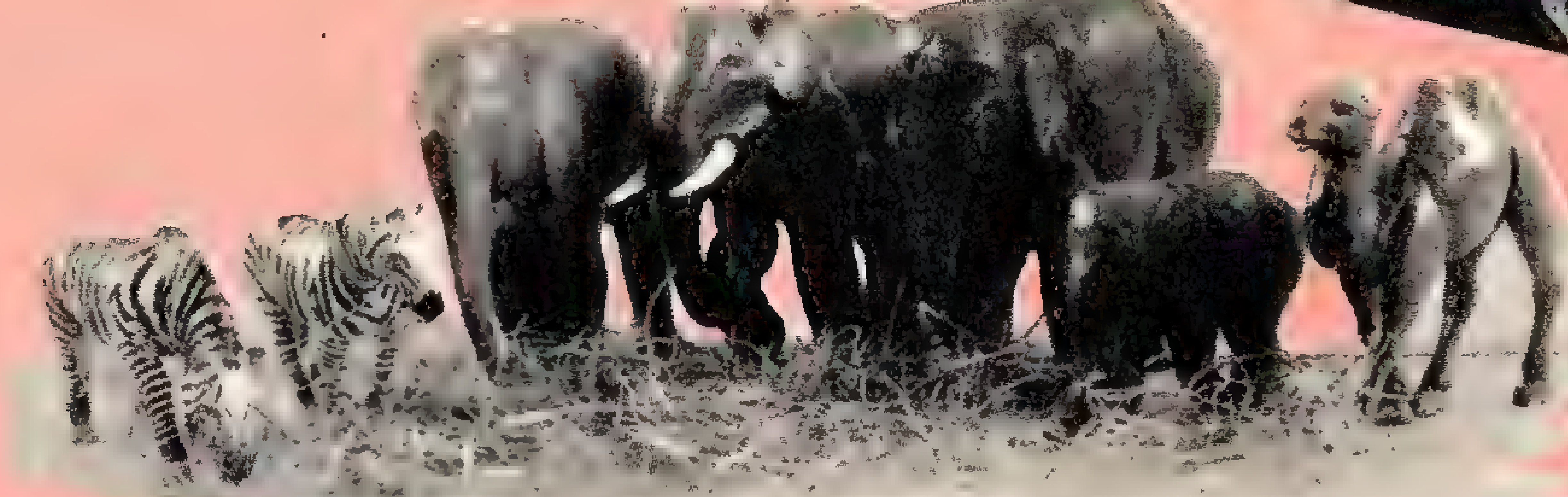
Majestically, two lions (above) survey spectators from their cage. Note the oil can atop one wagon.

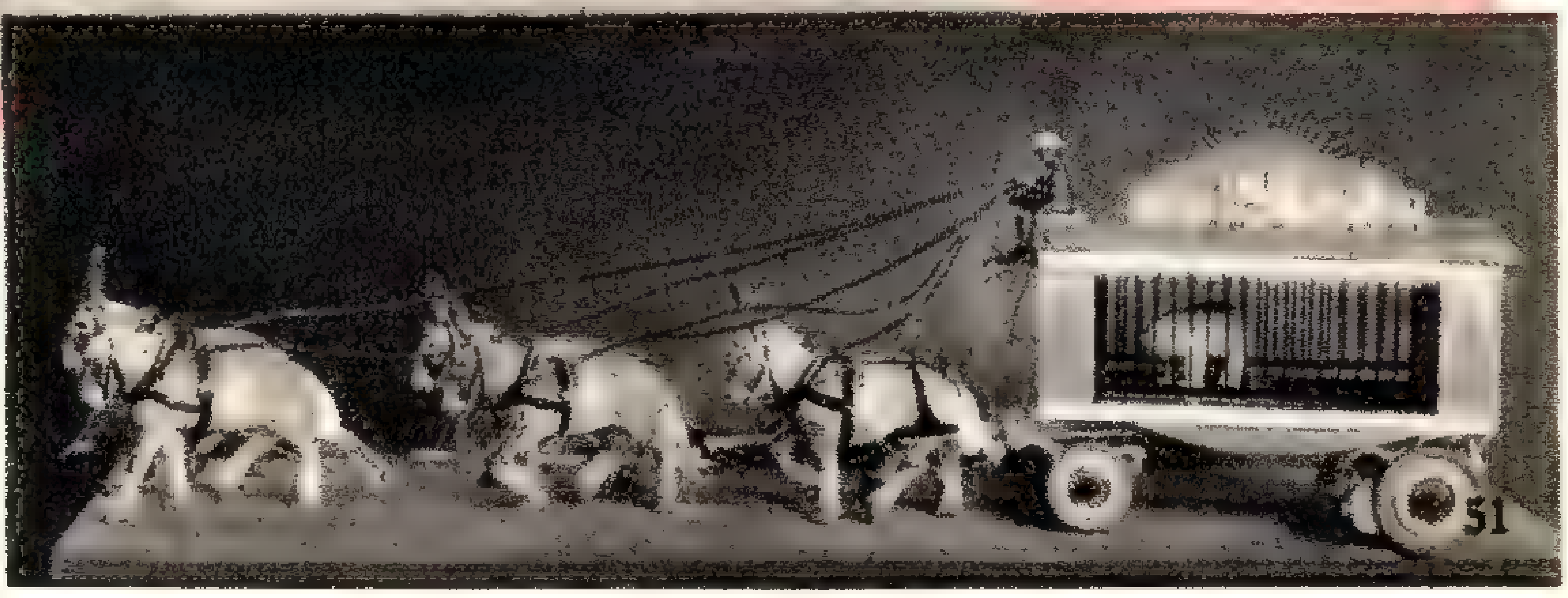


Above—Three of the unusually detailed menagerie circus wagons.



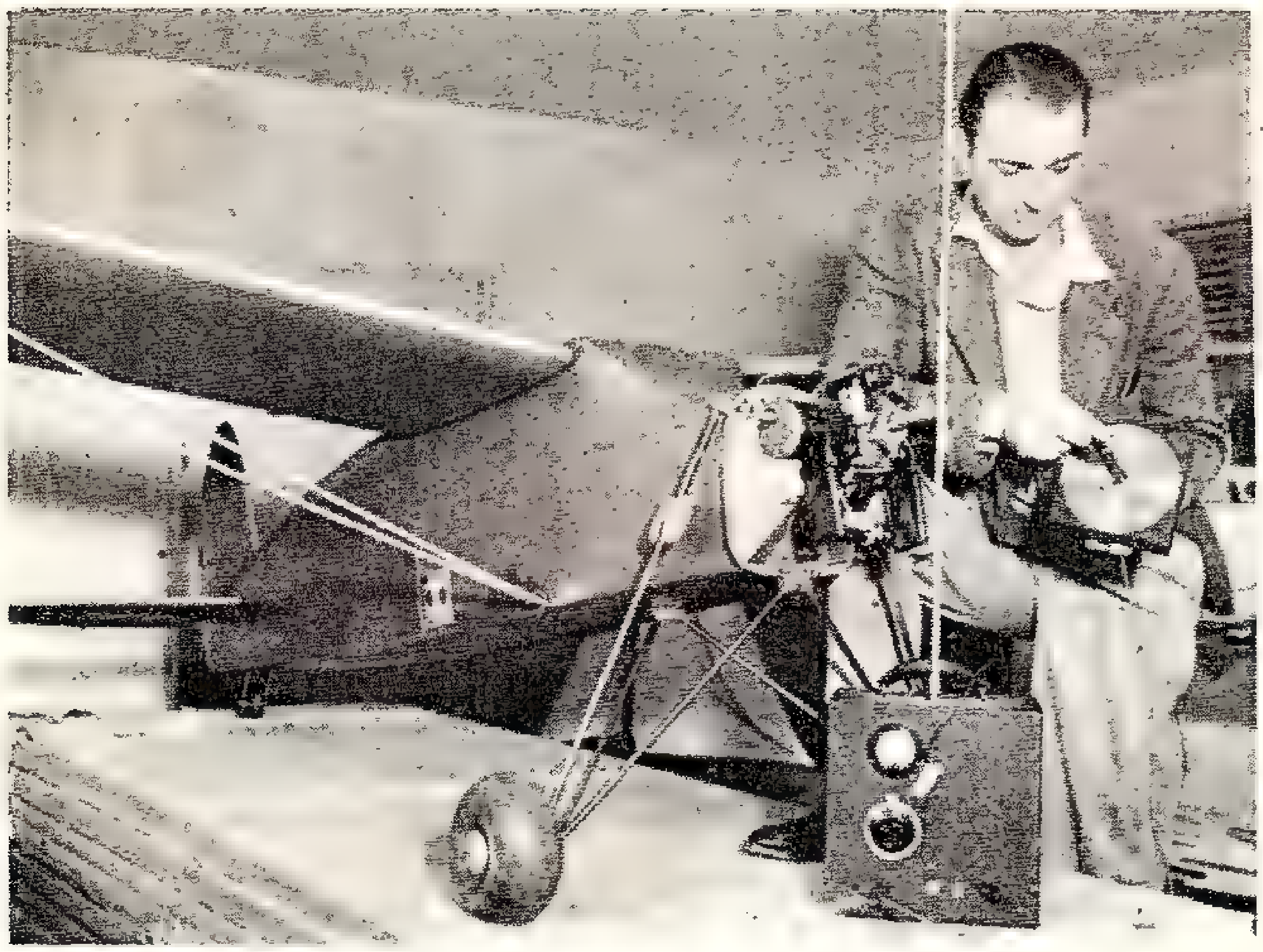
Realistic enough to cause spectators to shiver is the miniature Serpent Wagon exhibit, shown above.





Even a Lilliputian circus must have a feeding time for its animals, as shown in the photo above where elephants, zebras and a camel tackle some strewn hay. Right—A polar bear nervously paces his wagon cage as part of the "biggest little show" routine performance.

Model Plane To Serve As Target For Artillerymen



Paul. Whittier, veteran pilot, examines the ground radio equipment which will be used to control this 12-foot gasoline-powered model when it is used as a flying target during coast artillery maneuvers to be held in California.

POWERED by a three horsepower gasoline engine and equipped with controls that can be operated from the ground by radio, a huge model airplane will soon be used as a flying target by a unit of the 63rd Coast Artillery during maneuvers at Muroc Lake, Calif. If successful, trial flights of the miniature airplane will pave the way for general use of gas-powered models to train anti-aircraft and coast artillerymen. The model plane has a wingspan of 12 feet and its 8½-foot fuselage houses a special three tube radio receiver, which actuates the electric motors operating the controls.

Tiny Tea Set Worth $2,000

A MINIATURE Queen Anne silver tea set, valued at $2,000, was recently placed on exhibition in New York, N. Y. The novel set comprises a tiny tea pot, coffee pot, sugar bowl, cream jug, six cups and saucers and six teaspoons, all bearing the maker's hallmark of Jonathan Clifton, which was registered at the Goldsmith's Hall in London, England, during 1703.

The miniature tea set has an interesting history, having been found in the safe deposit box of an English lawyer after his death. Research indicated that the set had been given to him as a child by Lord Cornwallis, of Suffolk, England. Apparently, according to experts, the tiny set was originally planned as furnishings for some child's doll house.

A cigarette serves well as a size comparison for this tiny Queen Anne silver tea set which is said to be worth $2,000.

Machine Tests Peas' Quality

This young lady is placing peas in a new canning machine which performs the odd job of measuring their tenderness.

CUMBERSOME in size and featuring parts made from heavy iron, a new canning factory machine is designed for the delicate job of measuring the tenderness of peas. The peas under test are placed in a hopper on the machine and the force required to shear through them is recorded on a scale.

Simplified Deep-Well Pump Increases Efficiency 50%

Assembled Quickly, Weighs 30 Pounds

A 50% increase in efficiency over conventional deep-well water pumps using equal horse-power is claimed for a new light-weight pump cylinder recently developed by H. H. Raulerson, of Long Beach, Calif. The outstanding feature of the new cylinder is that it achieves the action of two pumps in one through use of a single plunger, which delivers a constant flow of water on both up and down strokes while reducing the water resistance. Instead of "breathing water" to eliminate vacuum resistance in the lower chamber, the new cylinder lifts to the surface all of the water which it takes in.

Simplified in construction because of the single plunger theory its operation is based on, the new pump weighs only 30 pounds compared to the 90-pound weight of conventional pumps of equal size. The cylinder head is a multiple-purpose type, serving as a sucker rod guide, valve guide and packing box. The entire cylinder can be quickly assembled and is so constructed that any part can be easily replaced if necessary.

Night View Of Edison Tower Makes Striking Photograph

Memorial Marks Site Of Early Laboratory

THE striking photograph shown above is a night view of the $100,000 Edison Memorial Tower at Menlo Park, N. J. The tower, which is 131 feet high and is surmounted by a 14-foot replica of the famous inventor's first incandescent lamp, marks the site of the laboratory where he produced the first practical electric light. The memorial was officially dedicated on February 11, the ninety-first anniversary of Edison's birth.

The replica of the incandescent bulb, which is atop the tower, consists of 164 pieces of glass cast in two-inch diamond patterns around a steel skeleton frame. The interior of the giant bulb features 960 incandescent lights and a 24-inch reflector. Because of its brightness, the tower bulb serves effectively as an airways beacon. Inside the tower base is an Eternal Light, which was set aglow by Edison on October 21, 1929, during a celebration the inventor was attending at Dearborn, Mich. Thousands of tourists are expected to visit the memorial during the height of the coming summer season.

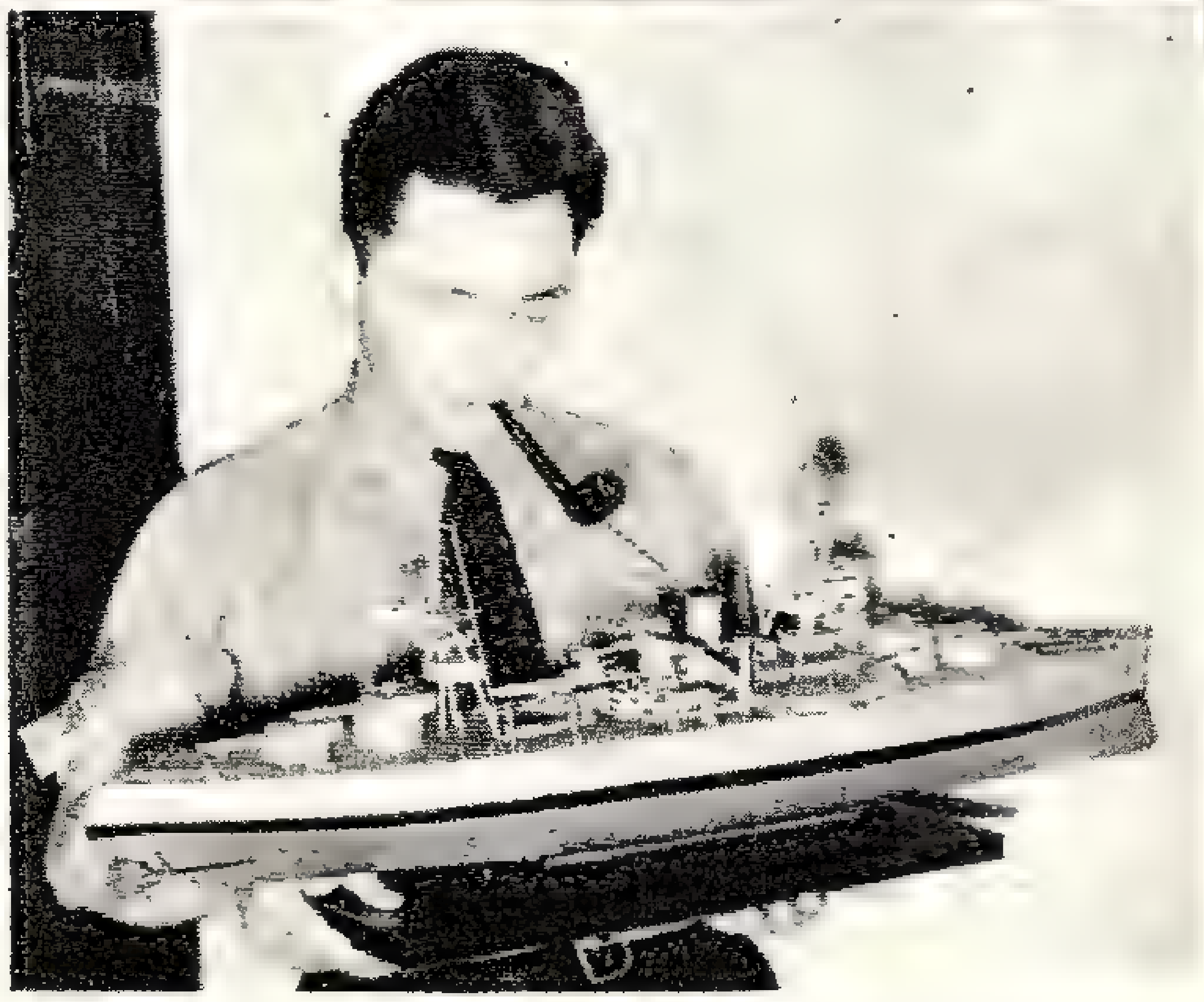
MODELERS DISPLAY CRAFT

An operating roundhouse (above) was a feature of the model exhibition.

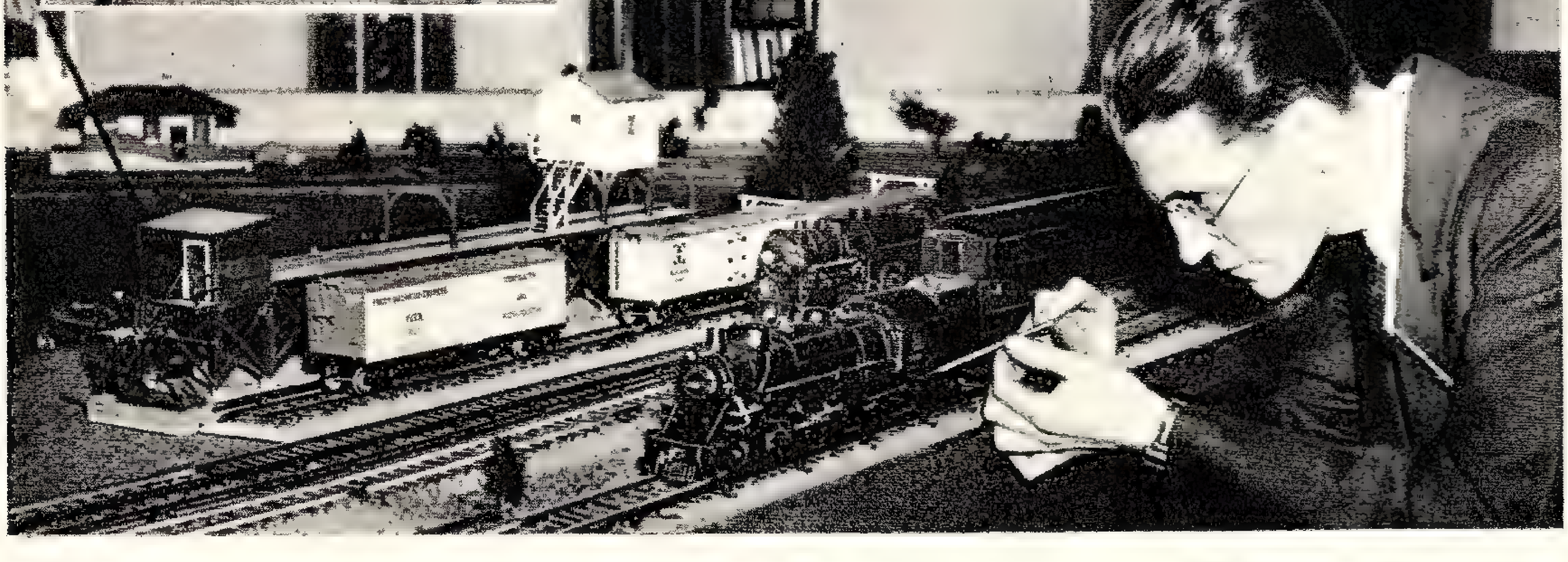
Working scale-models intrigued many visitors at the New York Society of Model Engineers Exhibition recently held in New York, N. Y. Left—A gasoline-driven power boat that can go 35 miles per hour.

●

The ever increasing interest in model railroading was evident at the show where detailed locomotives and freight cars, like those below, were rated as star attractions.



In the prize winning class is this model of *U. S. S. Texas.*



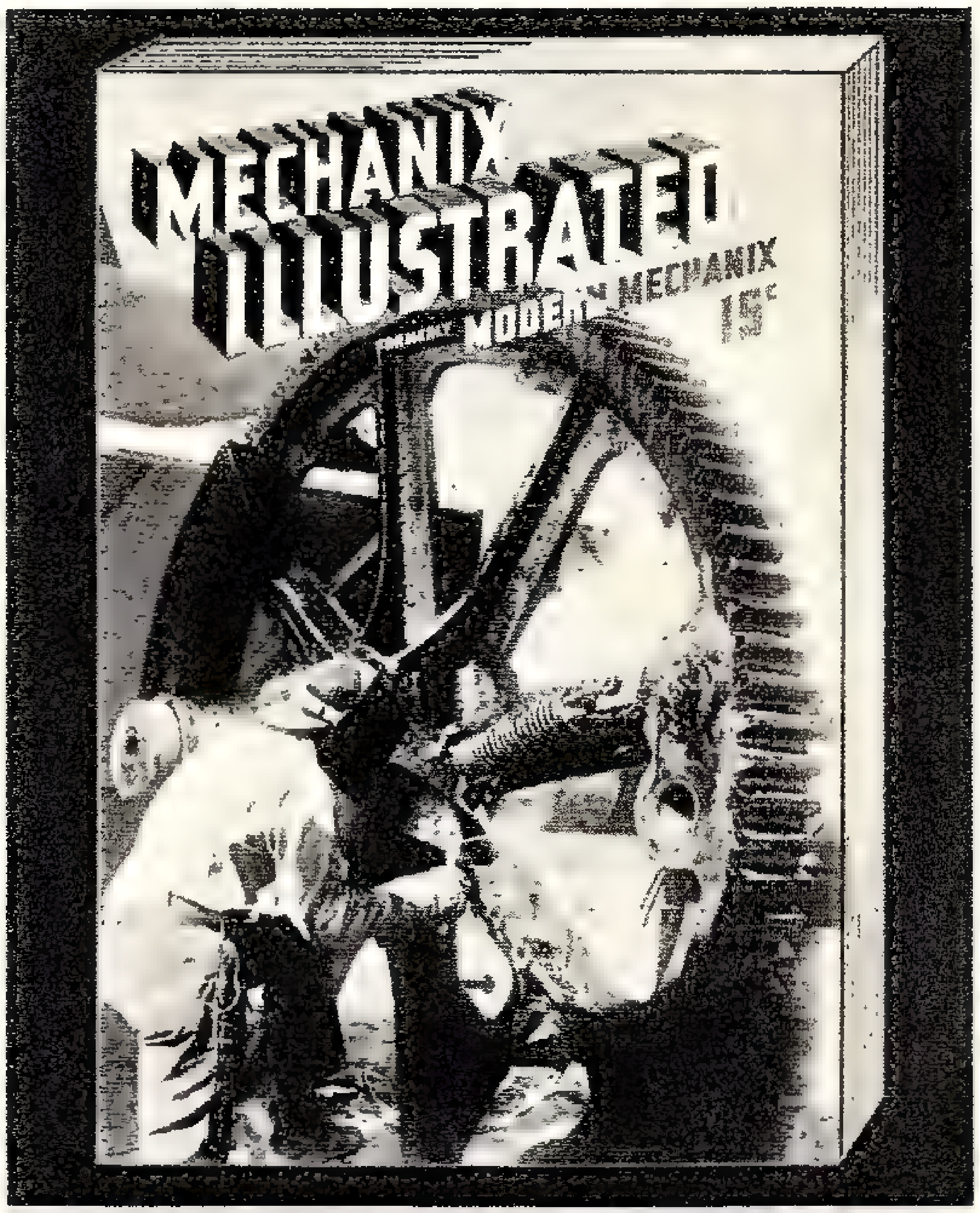
Next Month—We Change Our Title!

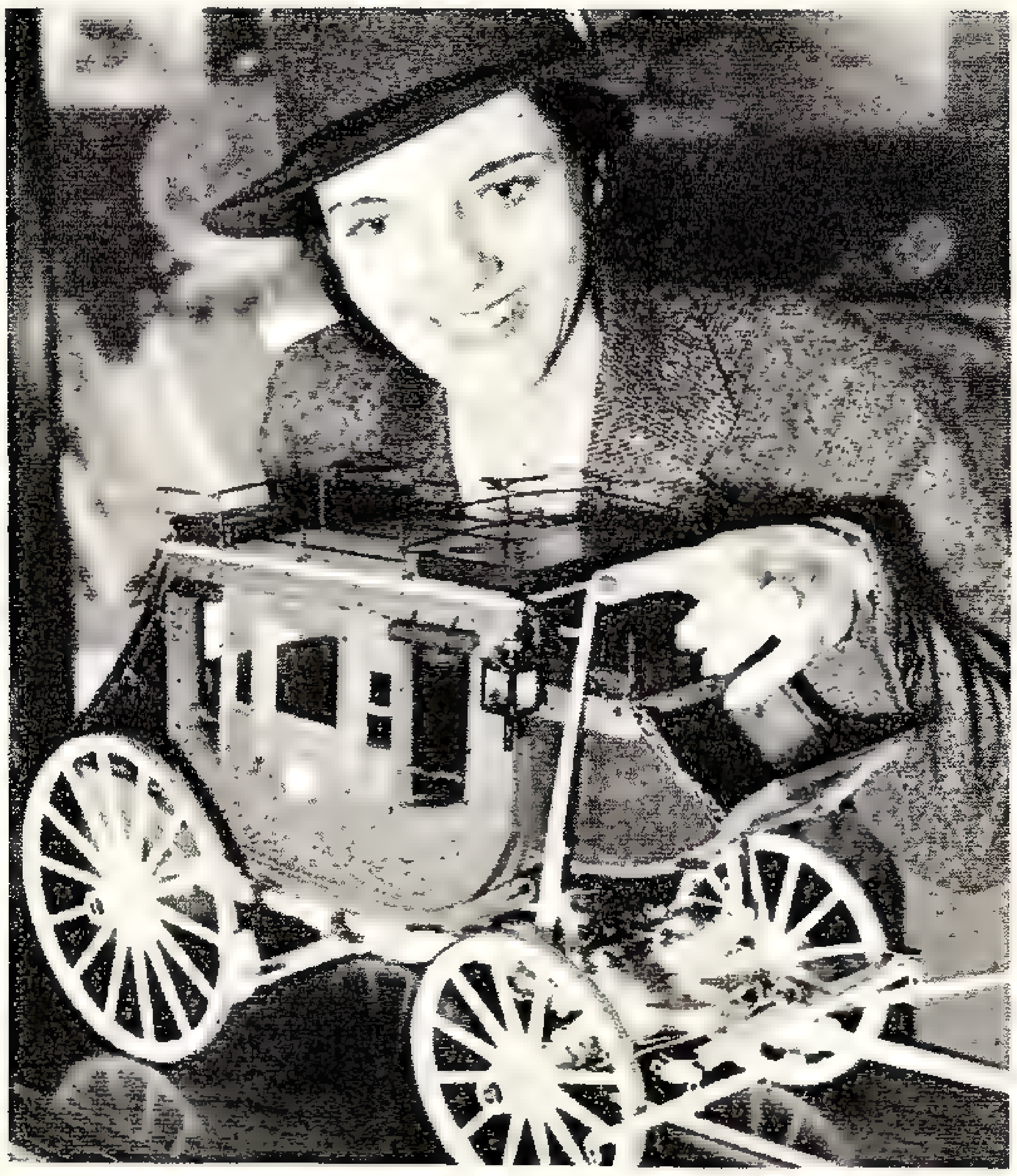
Look for the New MECHANIX ILLUSTRATED

BEGINNING with the June issue (on sale May 10) this magazine will be called MECHANIX ILLUSTRATED. It will have more pages and more pictures than before.

The cover, reproduced on the right, will be a striking color-photograph, with the new name displayed prominently across the top. Look for MECHANIX ILLUSTRATED on the newsstands on May 10, and buy your copy early, before your dealer's supply is gone.

You will find that the new MECHANIX ILLUSTRATED has more pages, more pictures of new inventions, more feature articles, more workshop plans, more "kinks"—and by far the largest and best photography department of any magazine in the field. The price remains 15 cents—and the June issue of MECHANIX ILLUSTRATED will be the biggest 15 cents worth of magazine you ever enjoyed.



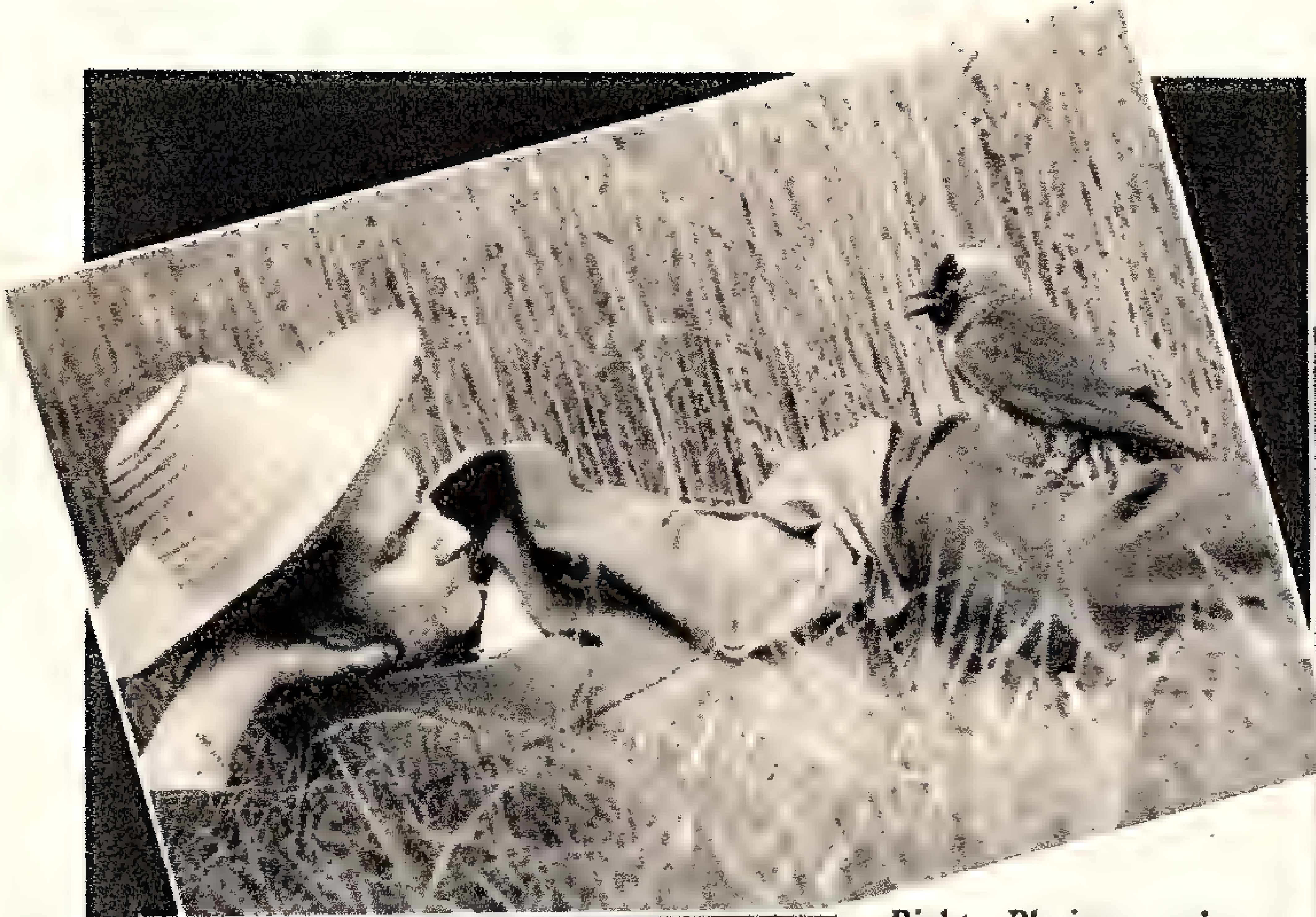


Tiny Stage Coach Model Valued At $1,500

Valued at $1,500, a tiny model of an old-fashioned stagecoach was recently placed on exhibition at an industrial design show held in Pasadena, Calif., to show design progress during the past three hundred years. The model is perfect in every respect and features leather upholstery, glass lanterns, straps and harness parts.

Apparatus Breaks Germs With Tonal Waves

A new apparatus, which by producing supersonic tonal waves, breaks up typhoid fever bacteria and other germs, has been developed by Dr. Leslie Chambers, a Philadelphia, Pa., research worker. The supersonic waves produce a single note, about two octaves above piano range, resembling the shrill note of a peanut roaster.



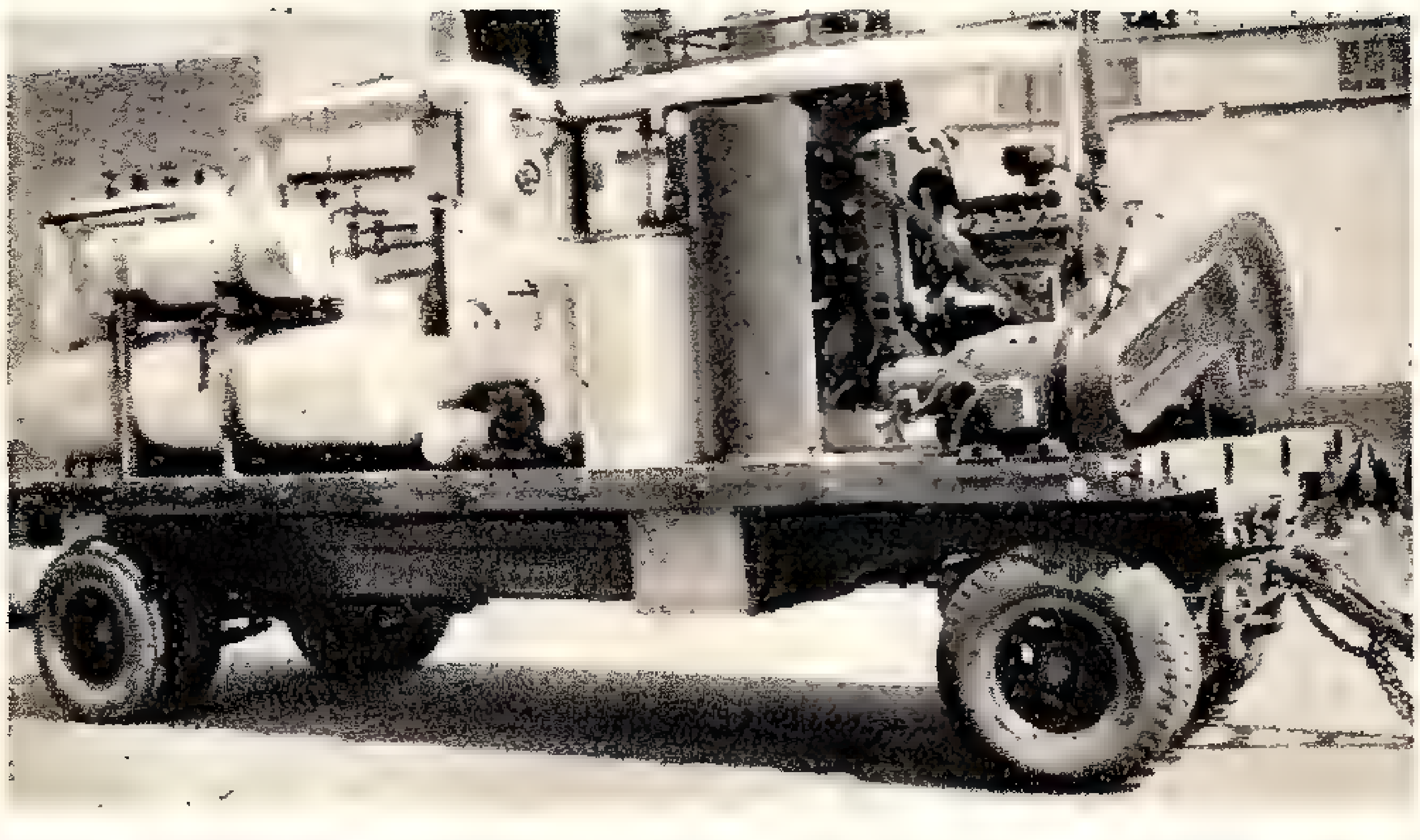
Right—Placing seeds on scarecrow to attract birds. As birds grew bolder, they alighted on farmer (left).

FOOLING The BIRDS

A "tamed" starling alights on scarecrow.

BIRD lovers who would like to make friends of members of feathered flocks frequenting nearby woodlands will do well to follow a system devised by a German farmer. He placed some bird seed on the brim of a scarecrow's hat and in the bowl of a pipe placed in the dummy figure's mouth. This process was repeated daily. Then, one day, the farmer donned the scarecrow's hat, reclined on the ground and—the birds came to feed off the hat as usual.

Ice-Making Unit Mounted On Trailer-Type Truck



Easily transported from place to place, this complete ice-making unit is capable of making nearly five and one-half tons of ice every 24 hours.

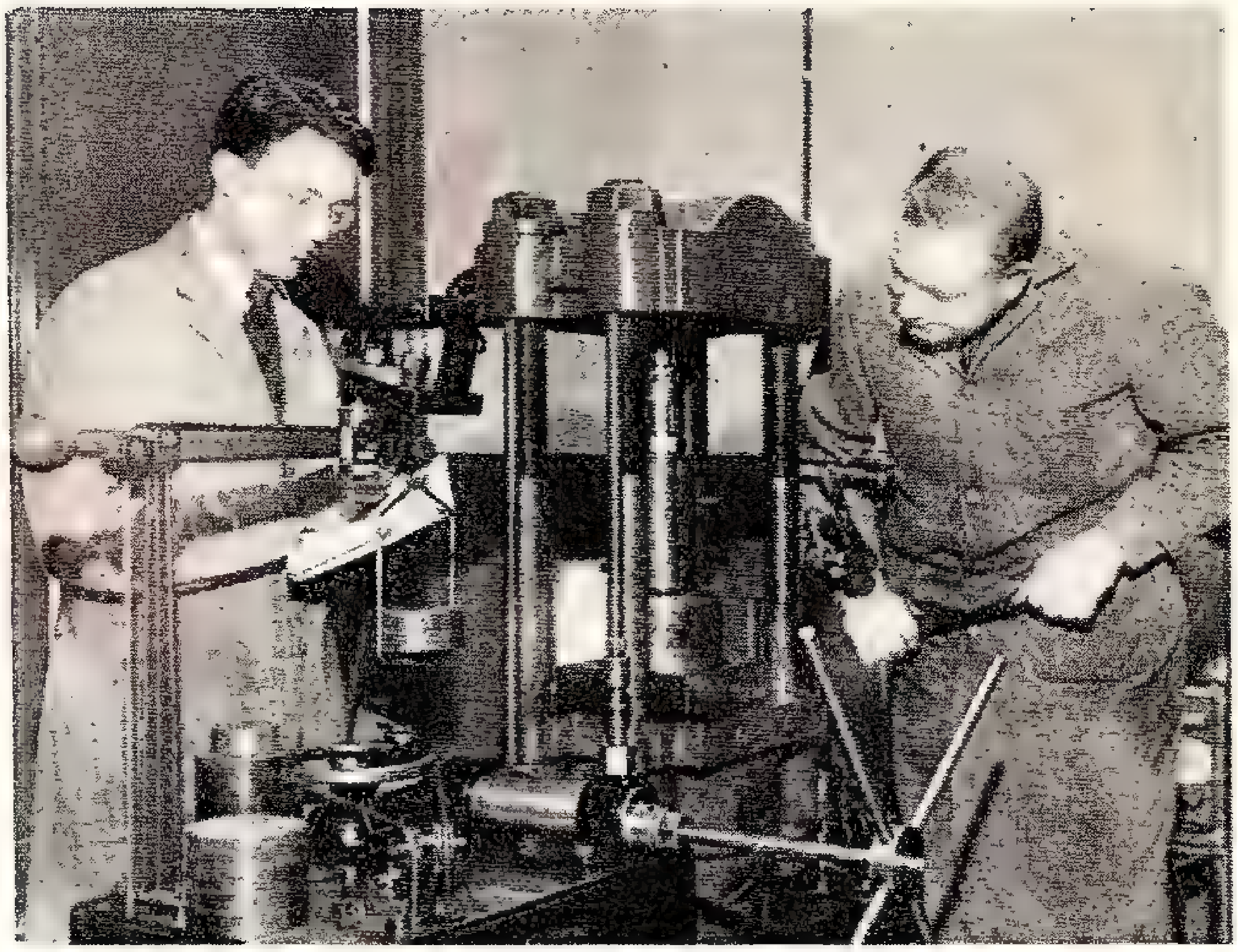
MOUNTED on a trailer truck so that it can be easily moved from place to place, a newly developed ice-making machine is capable of producing nearly five and one-half tons of ice every 24 hours. The entire assembly comprises a brine cooling system, an ammonia compressor, a condenser, economizer, water pump and an oil engine. The unit was designed for use in communities where fruits and vegetables are grown, but where refrigeration facilities are lacking.

New Tool Exerts Pressures Up To 1,500,000 Pounds

A NEW tool for scientific research which develops pressures of 1,500,000 pounds per square inch, a maximum exceeding any pressure previously attained, has been developed at the research foundation of the Armour Institute of Technology.

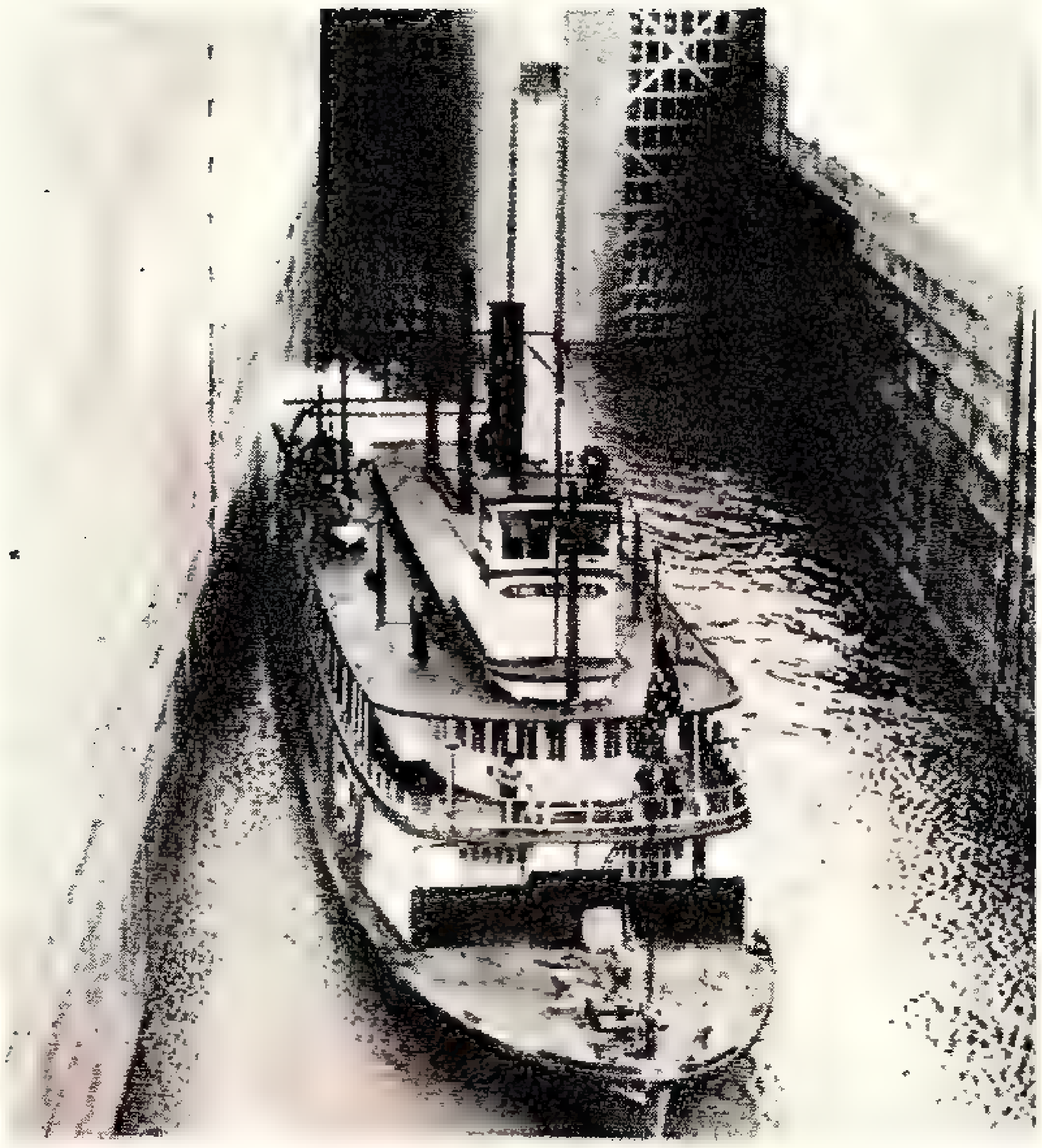
Many new fields of research are now open with this device, including the earth's structure 200 miles below the surface, and behavior of untapped energy in the interior of the atom.

The photograph shows Robert Williams (left) assistant, and Dr. Thomas Poulter, director of the research foundation, demonstrating how the equipment develops a 1,500,000-pound pressure per square inch. Note the massive size of the bolts and nuts holding the top section.



With this tool, pressures up to 1,500,000 pounds per square inch are possible. This new device opens new fields of research including the behavior of untapped energy in the atom and the earth's structure 200 miles down.

Lock Raises Vessel 60 Feet



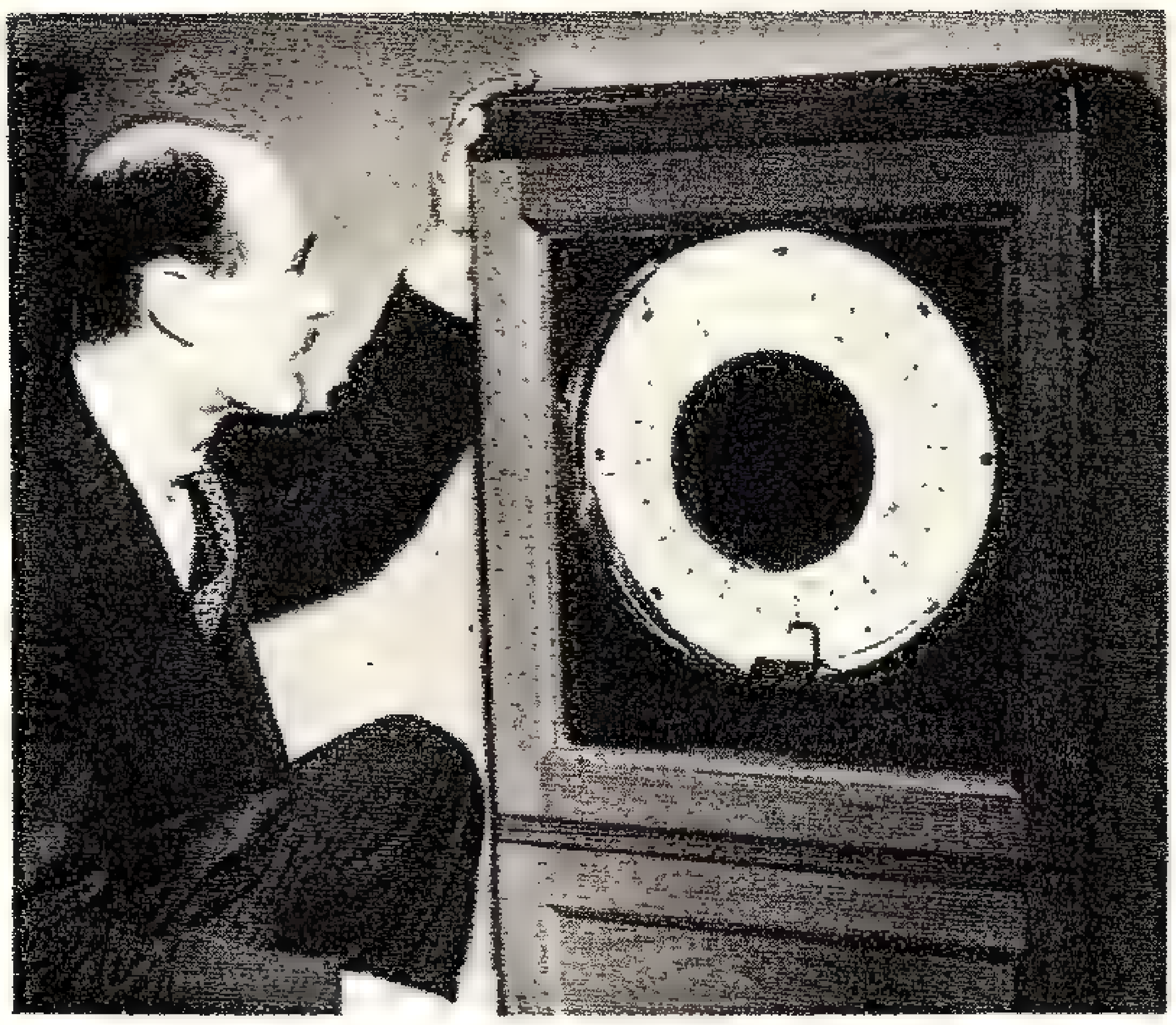
The stern wheeler, "The Dalles," is dwarfed in the gigantic lock at Bonneville Dam, which can raise vessels sixty feet. Ocean craft now can travel 200 miles up the Columbia River.

THIS large lock can raise vessels going up the Columbia River, sixty feet, a world's record for a single lock. With the completion of Bonneville Dam and locks, Dalles, Ore., 200 miles from the sea, hitherto an inland point, now becomes a seaport.

Device Shows Bus Location

LONDON Transport plans to try an experiment never before attempted anywhere in the world, and if successful for regular use, will give the main office of a bus transportation company a "picture" of the city's moving buses.

Each bus will carry on its roof a coil of wire through which will pass an alternating current. At certain fixed points a wire will be suspended across the road where the bus will pass. As it passes, it induces a current in the wire which in turn records the passing on the "clock."



This "clock" will record the movement of buses past certain predetermined points along the highway, thus indicating in the main office the position of buses at any time

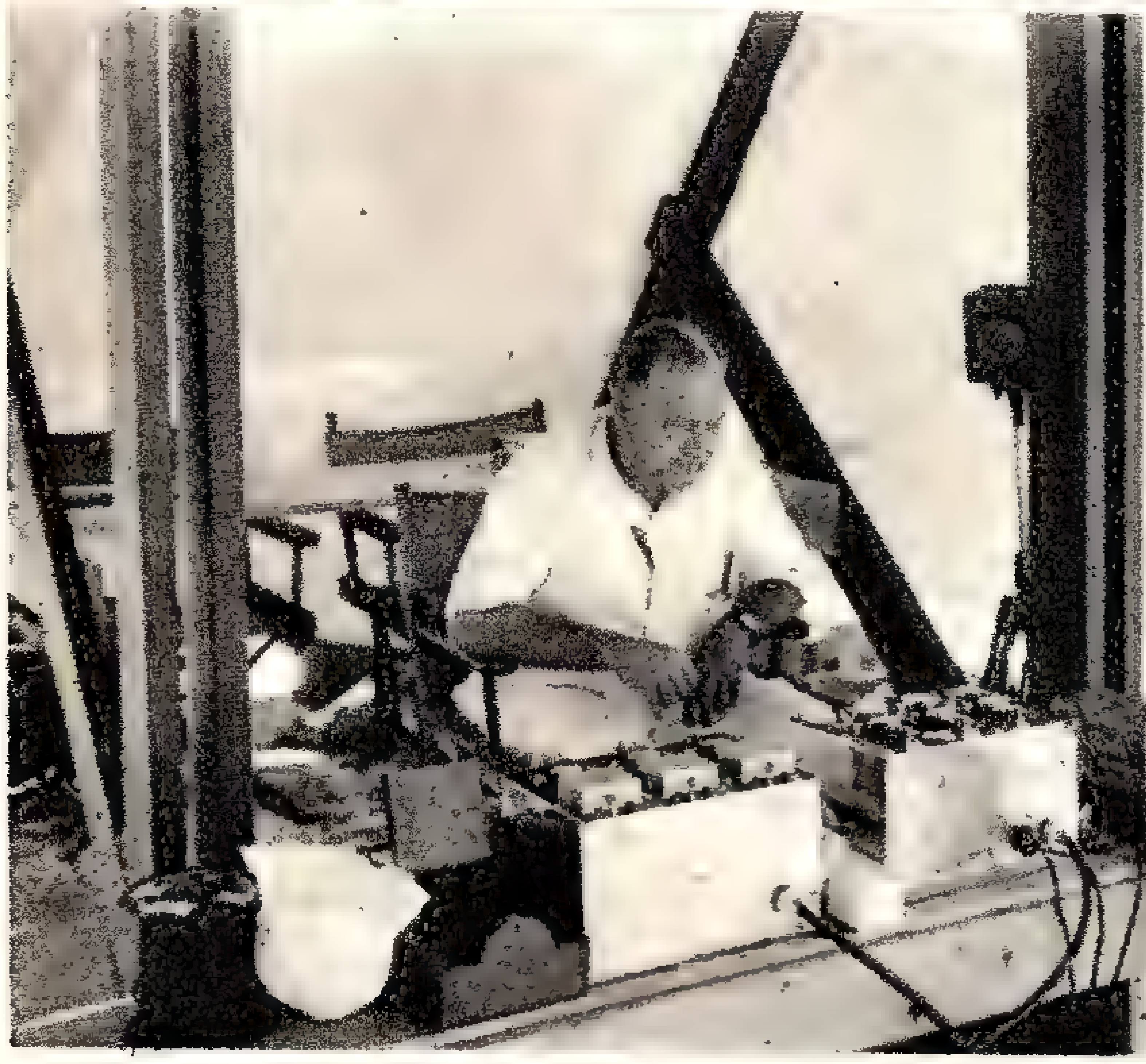
The MEN Behind

by

Maxwell Reid Grant

STOP
NEXT LAP
2000 MI

Official records require strict adherence to rules under supervision of the A.A.A.



Top—Muroc Lake is the scene of many gruelling car tests and new records. Above left—Electrical timers keep an accurate check and furnish indisputable evidence of records. When endurance tests are being conducted, flares light the course during the night. Hour after hour, cars speed around the course while A.A.A. officials watch every detail of the test.

ROARING around an outlaw track in a warm-up lap, a racing driver noticed one of his front wheels wobbled dangerously. Quickly he pulled into the pit, where mechanics found a front spindle broken. It was too late to change before the race.

A few minutes later the car rolled across the starting line with the spindle welded. As the driver streaked around the course on the third lap, the welded spindle suddenly parted. His car left the track, rolling over and over. The unfortunate driver was picked out from a pile of smoking, twisted wreckage.

Such an accident under American Automobile Association control would never have happened, as the car would not have been allowed to start. Power to bar an unsafe car from the track belongs to a little group of technical experts who hold in their hands the lives and reputations of drivers upon the

the STOP WATCH

Error is reduced to a minimum by having electrically controlled devices do all the measuring. The instruments are watched constantly by officials.

nation's major speedways. That's why the "Three-A" contest board is the supreme court of the racing world, and why its decisions are final.

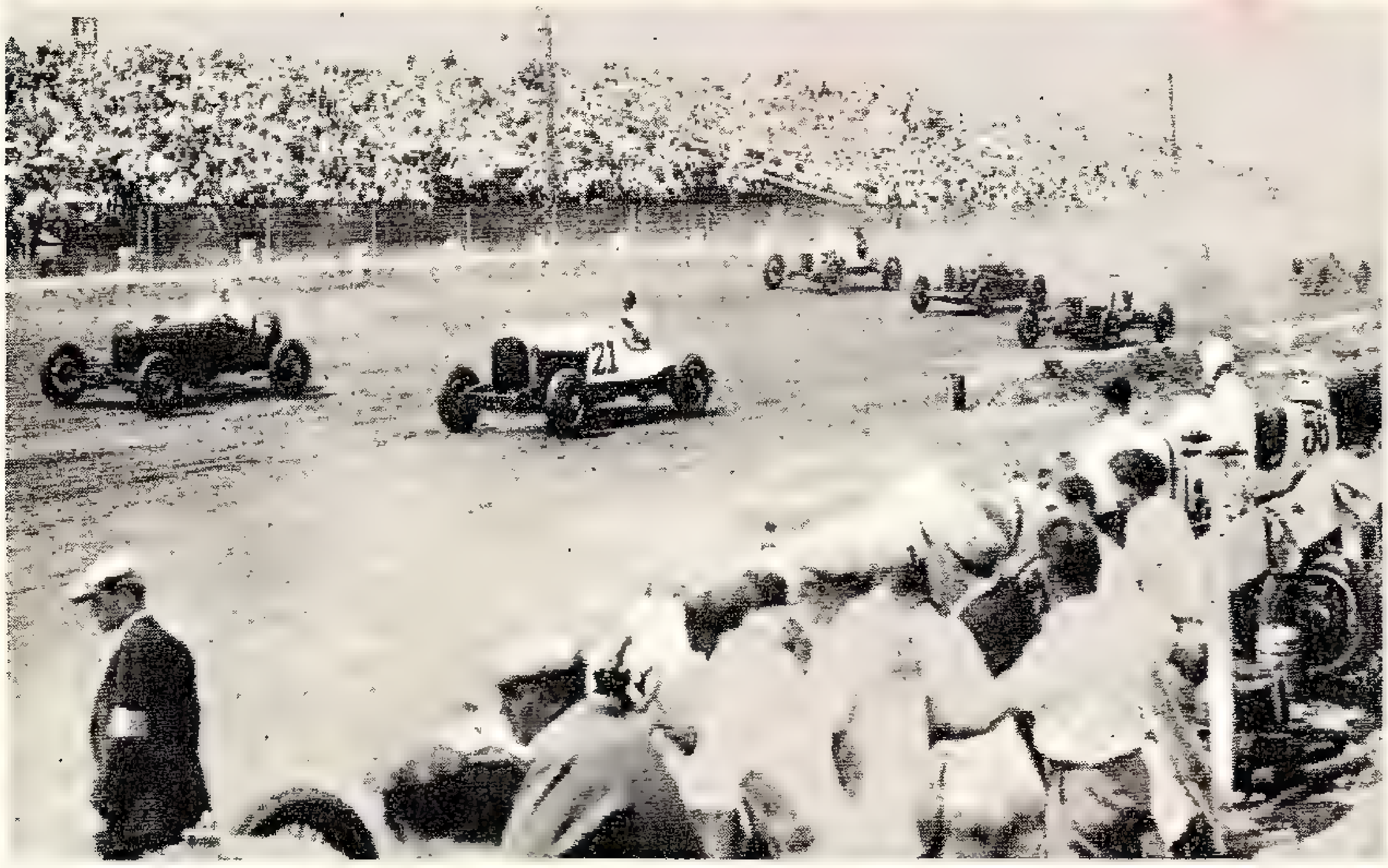
Perhaps you have seen the yellow flag suddenly raised during an exciting contest. An A.A.A. man has noticed some unforeseen danger on the track, and drivers are warned to hold their relative positions until the green flag tells them of hazards cleared. Then they must make a complete lap before applying a heavy foot to the accelerator. Just a short time ago, for example, a racing car broke an oil line, spilling oil on the track. Up went the yellow flag. All drivers eased their throttles until the green flag was raised to show the track clear.

Here is a battery of electrically controlled stop watches. Large charts are kept and every lap accurately recorded. Every possible precaution is taken to prevent slightest error in records.

Long before the crowd fills the grandstand, A.A.A. men have been busy behind scenes. Cars have been inspected and then impounded to await the starting signal. All are thoroughly examined for safety, especially front axles and steering mechanisms. Specified devices such as safety arms to prevent losing of wheels, and a fire dash between driver and engine compartment, must be carried. If a car is too light for good driving, the driver may not "slug" his mount by carrying sand-bags or other weight, unless it is built into the car. The hood must be fastened securely with two straps over it. If a driver loses it during a race, he must retrieve it next lap.

The A.A.A. is the American branch of the parent association, the Internationale des Automobile-Clubs Reconnus. Racing clubs register as members, accepting its authority to rule on all mechanical phases of their contests. Disputes between drivers come before this court of the track for settlement. Sometimes one racing pilot will accuse another of forcing him into a spin by crowding. A committee hears the complaint, and if it cannot settle it, refers it to the national committee, which meets four times yearly in Washington.

Six times in eight main-event races, a cer-



The finish of a test run on Muroc Lake. When a car passes the finish line officials compute records made during the run. Because the race track is the automobile world's greatest laboratory, official records must be made under accurate and strict supervision. A.A.A. officials supervise both speed and economy races to compel strict adherence to specified rules. Before the start of any race, all cars are examined for safety, especially axles and steering mechanisms.

tain driver roared across the finish line ahead of the whole field. Other drivers became suspicious of his good fortune. "He's using loaded dice," was the whispered gossip. Finally some one lodged a complaint with the A.A.A. Technical Inspector who then examined the car and found it well below the maximum compression ratio and displacement allowed by the rules. His findings gave the driver a clean slate; but if the motor had not met specifications, he would have been ruled out of the game for a year, and in addition would have been heavily fined.

Because the race-track is the automobile world's greatest laboratory, official records must be made under accurate and strict supervision. A.A.A. men supervise both speed and economy races to compel rigid adherence to specified rules.

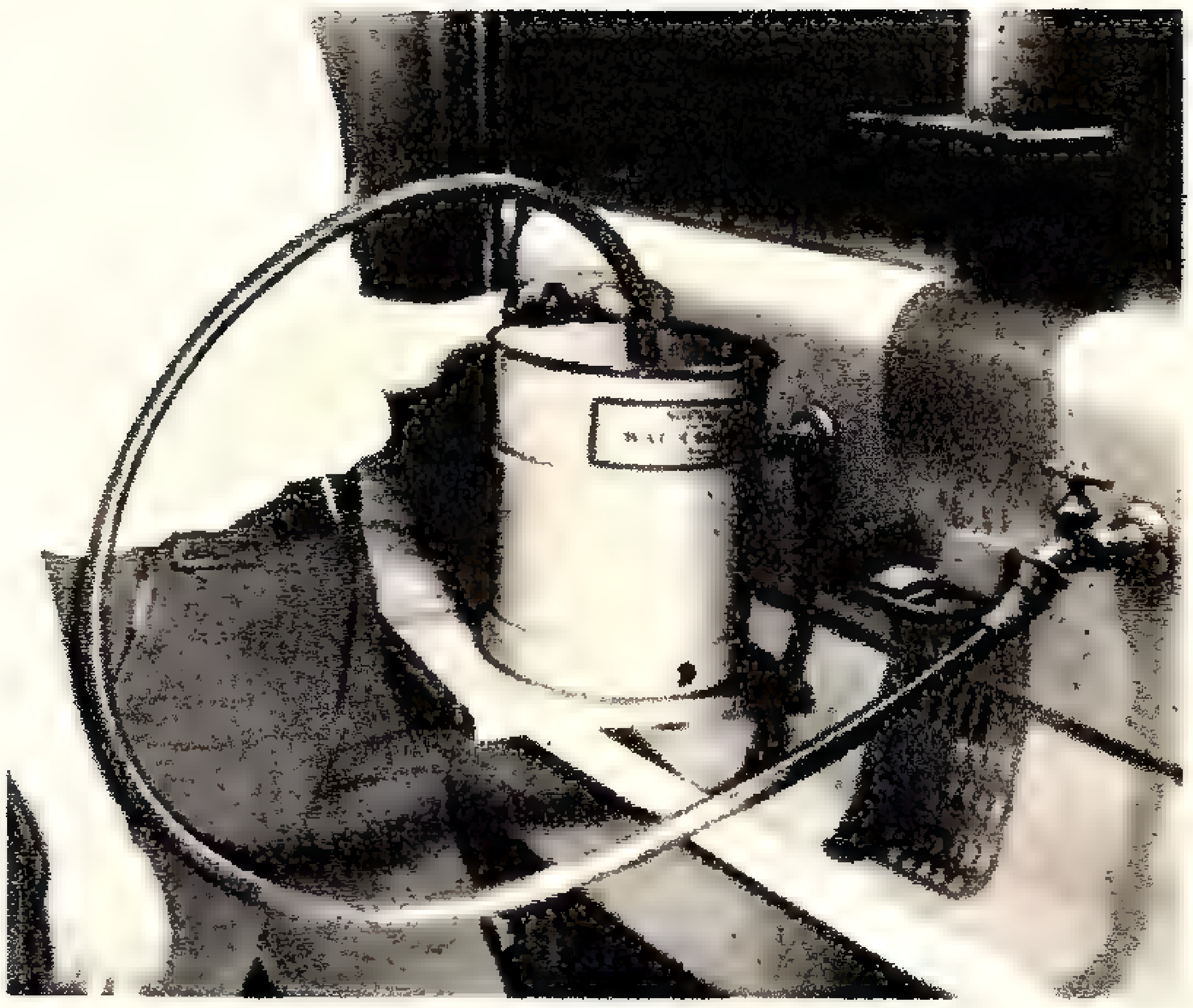
A leading race driver piloted a stock car across the continent in an economy run. When the car arrived in Los Angeles, A.A.A. inspectors found that the head had been planed down, raising the compression ratio. The record was not allowed, and another car had to be selected, to repeat the run. It cost the manufacturer more than three thousand dollars, but it was worth it, for otherwise the record would have been open to question.

When automotive engineers test their designs by staging transcontinental runs, usually the A.A.A. experts are called in to supervise. Not long ago an A.A.A. man walked into an eastern salesroom and at random chose a stock sedan from the floor, for use in a test run. A manufacturer wanted an official test of his radically stream-lined automobile, incorporating airplane principles of design which engineers said should cut wind resistance by as much as forty per cent.

Mechanics under A.A.A. supervision tore down the car selected, checked parts against stock specifications, and reassembled it. The

[*Continued on page* 132]

New Device Quickly Removes Hardness From Water



DESIGNED to eliminate hardness in water, this bucket can be placed near any water outlet to obtain an unlimited supply of soft water. Synthetic zeolite used in the bucket, not only removes properties that go to make for hardness in water, such as lime, calcium, magnesium, etc., but it provides a water that tests have proved to be softer even than rain water.

No chemicals of any kind are added for this result. In use, the rubber hose is connected to the usual outlet so that the water first goes into the pail before passing into the sink.

Automatic Machine Cuts Ice Into Small Cubes

THIS machine saws a 300-pound piece of ice into standard size ice cubes in about seven minutes. The cake of ice stands on its end on a small elevator. As the sawing progresses, the block of ice is automatically raised about one and one-half inches at a time. The top of the cake is cut off by a horizontal saw to make an ice slab of the correct thickness. This slab then is subjected to the action of two sets of vertical saws, so that the ice is cut lengthwise and crosswise into cubes which then drop into the iceman's bag, or are carried to storage by a conveyor. The clean "snow" resulting from the cutting can be used for many purposes, and is stored within the cabinet in a box which is easily emptied while the device is operating. The machine is entirely automatic and safe.

Tilting Ash Tray Eliminates Fire Dangers

EQUIPPED with a self-tilting mechanism, this ash tray makes it impossible for a cigarette to burn down so short that the weight of the over-hanging end causes the cigarette to over-balance and fall off the tray and burn the table or rug. If the cigarette is allowed to burn for any length of time while on the rest, its heat causes a spring within the tray to expand and tilt, thus dumping the burning butt into the tray. This tray in use eliminates not only the danger of damaging furniture as the result of forgotten cigarettes, but the possibility of fire from the same cause.

Dr. J. J. Nassau adjusts the telescope which he used recently to take a photograph of sunspots. Right—The unusual sunspot photo with an earth mark to serve as size comparison.

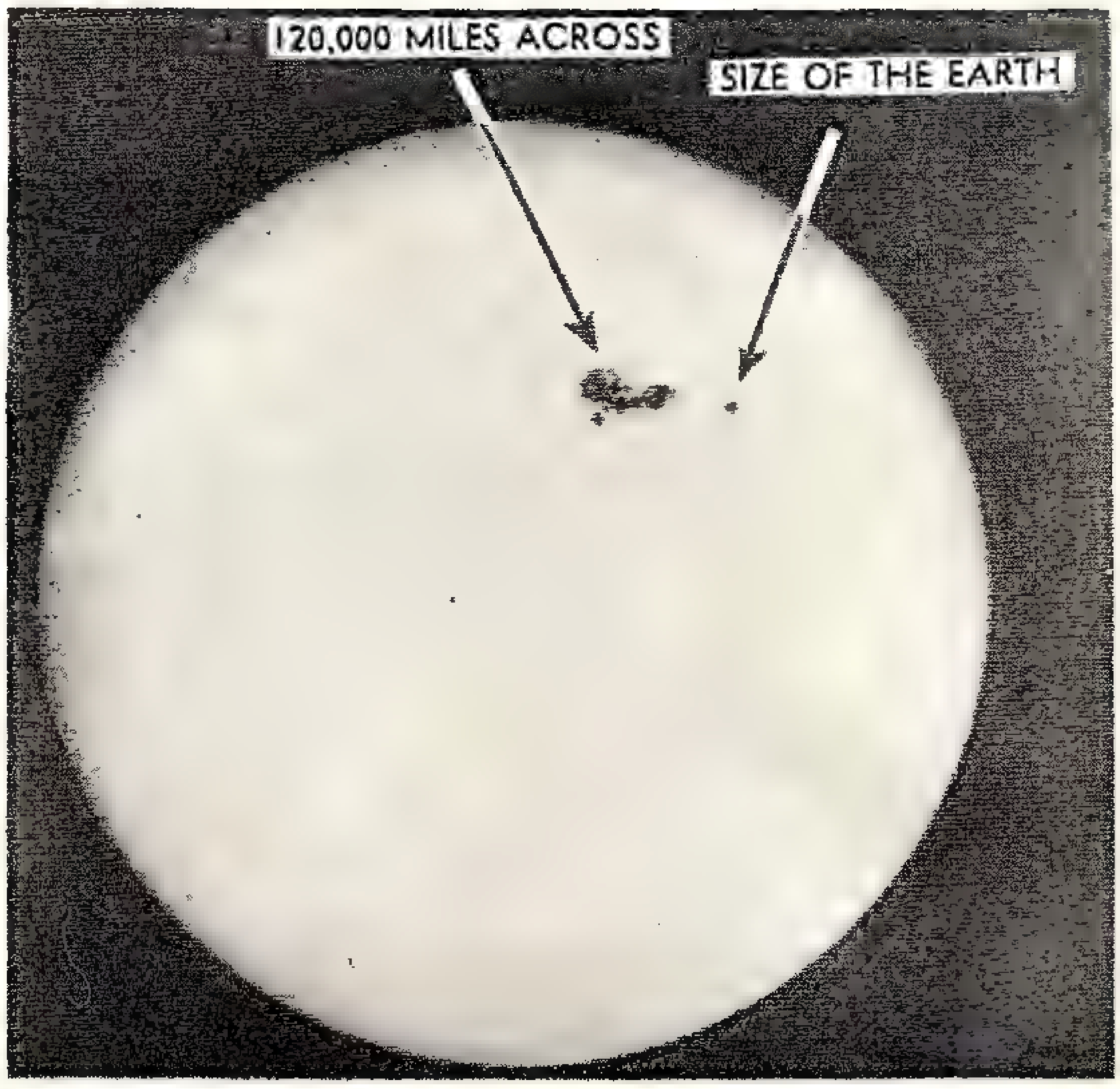
Auto Courtesy Light Devised

BETTER road manners may result if an automobile signal device recently placed on the market becomes popular. Mounted on the radiator cap or at the rear of the auto, the device enables the driver to acknowledge courteous driving on the part of another motorist by flashing the words "Thank You" in illuminated letters, which are visible night or day. A control on the dash or steering wheel operates the signal light and drivers report that passing motorists are first surprised, then pleased, by the unusual display of highway courtesy.

Controlled from the dashboard, this auto signal light flashes "Thank You" to acknowledge highway courtesies.

Scientist Secures Photo Of Large Sunspot Group

AN UNUSUAL photograph of a number of sunspots, so large that they could be seen by the naked eye when viewed through a piece of smoked glass, was recently made by Dr. J. J. Nassau, director of the Warner & Swasey Observatory of the Case School of Applied Science in Cleveland, Ohio. The big group of spots, numbering 35 in all, covered an area 120,000 miles long and 60,000 miles wide. One particular sunspot had an estimated diameter of 10,000 miles, surpassing the earth's diameter by 2,000 miles.



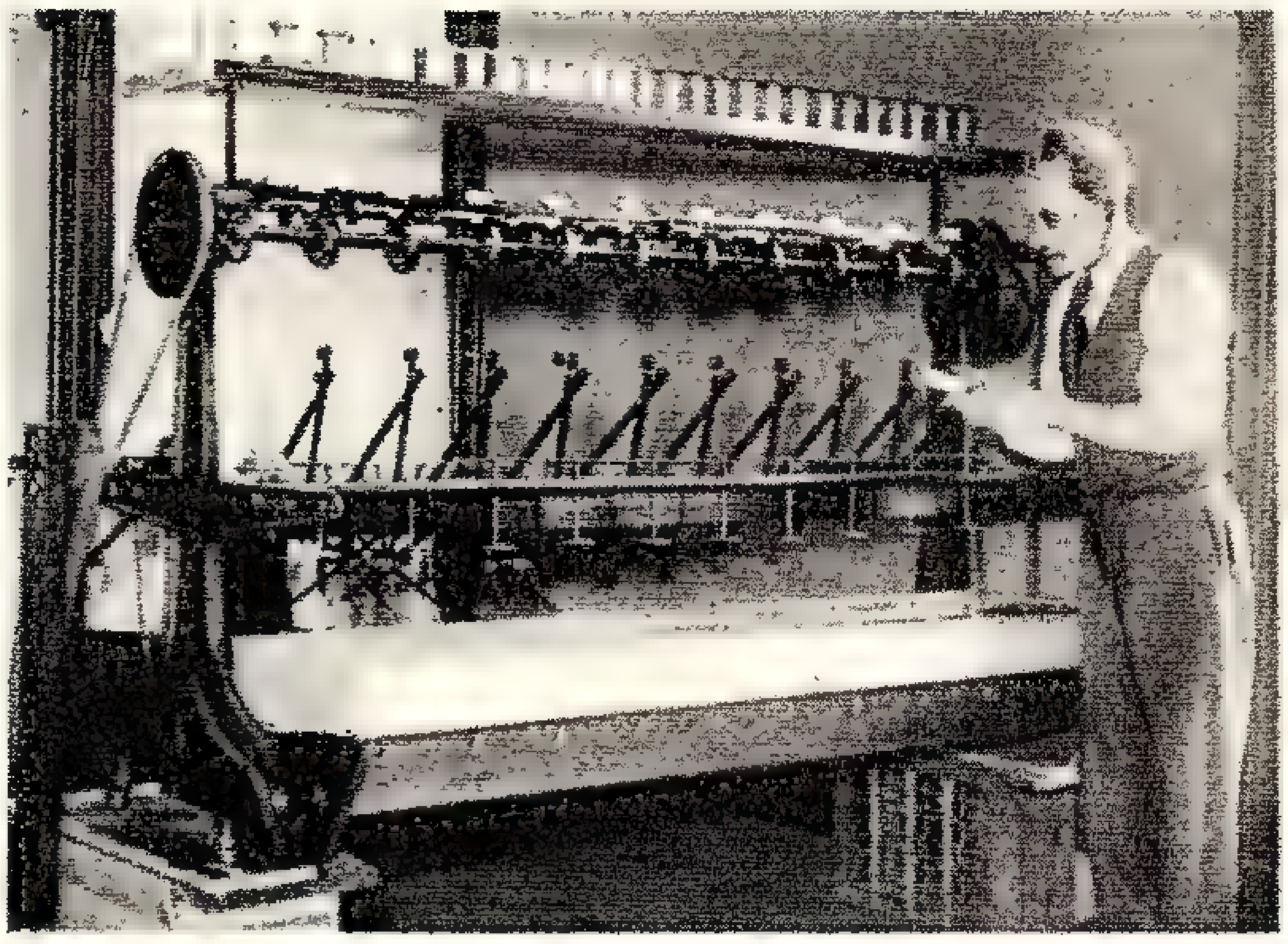
Aero Experts Praise Diesels

ADDRESSING a meeting of the Society of Automotive Engineers in Detroit, Mich., government aviation experts predicted that Diesel engines would replace gasoline-fueled motors as power plants for future aircraft. The almost negligible ability of Diesel fuels to burn except under the special high pressure and temperature conditions within a Diesel engine, as well as the low fuel consumption-high power rating of modern Diesels, is the basis for the experts' forecast. According to the same authorities, the Diesel engines used in German airplanes today are accomplishing what enthusiastic engineers are only predicting for gasoline motors five years hence.

If you are interested in any of the items mentioned in this issue, send a stamped, return envelope for the address of the manufacturer.

Seeks To Found Major Silk Industry In America

Breeds 15,000 Silkworms In Home And Perfects Reeling Machine

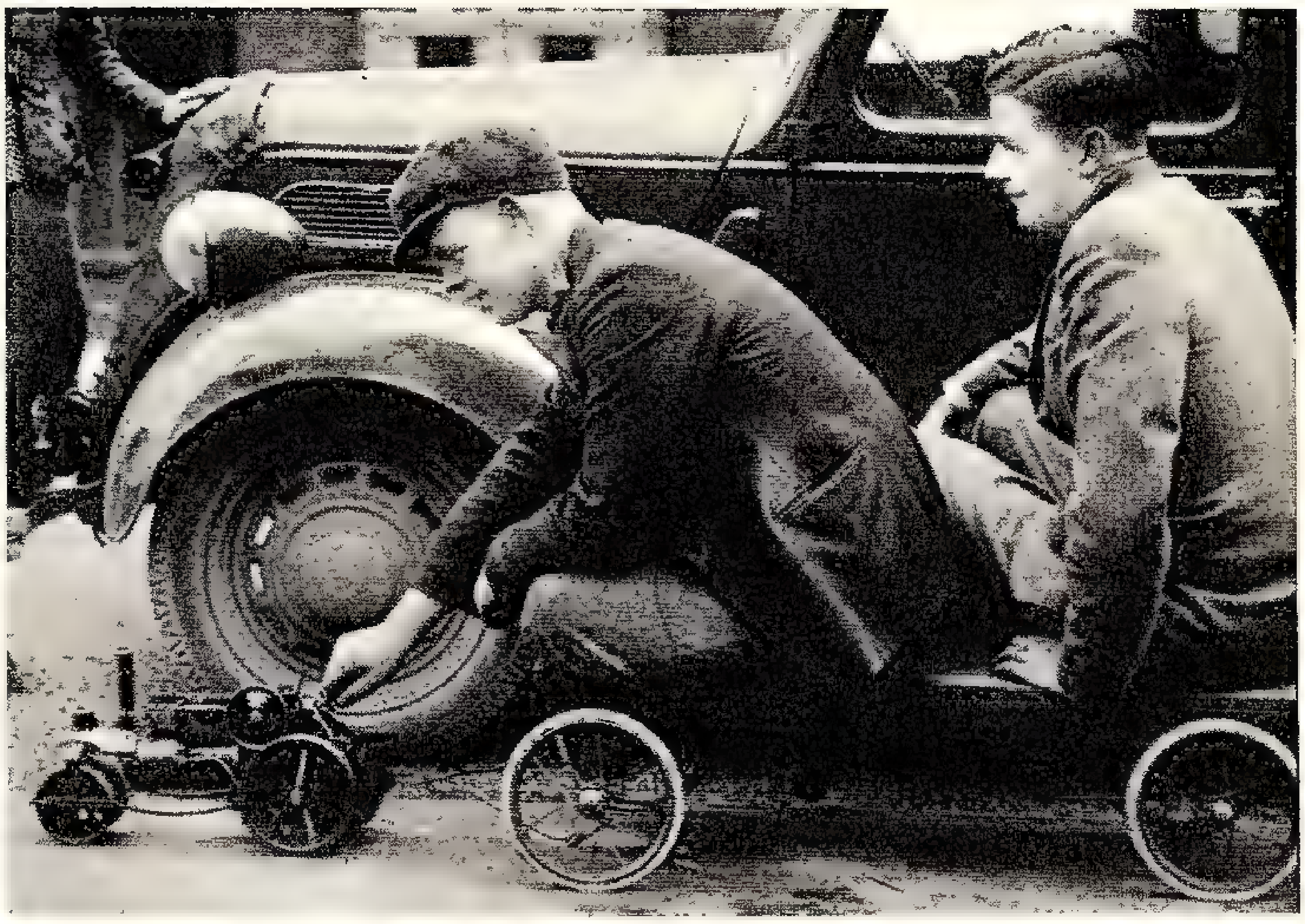


STARTING modestly with 15,000 silkworms, housed in the garret of his home in New York, N. Y., John Ousta hopes to found a major silk industry in the United States. He is now perfecting what is said to be the first silk-reeling machine ever constructed in this country and with this apparatus and his improved methods of breeding the silkworms despite adverse conditions he feels certain an American silk industry can be built up within a reasonable time.

'Phonograph' Tests Mentality

DESIGNED to aid psychologists in determining the mental rating of patients of the crime clinic at the Institute For The Scientific Treatment of Delinquency in London, England, a newly developed machine resembles a portable phonograph in appearance and operation. A waxed record, bearing a series of small red dots, is revolved at varying speeds and the patient is required to jab at the dots with a stylus pen, the number of hits or misses serving to classify the patient's mentality.

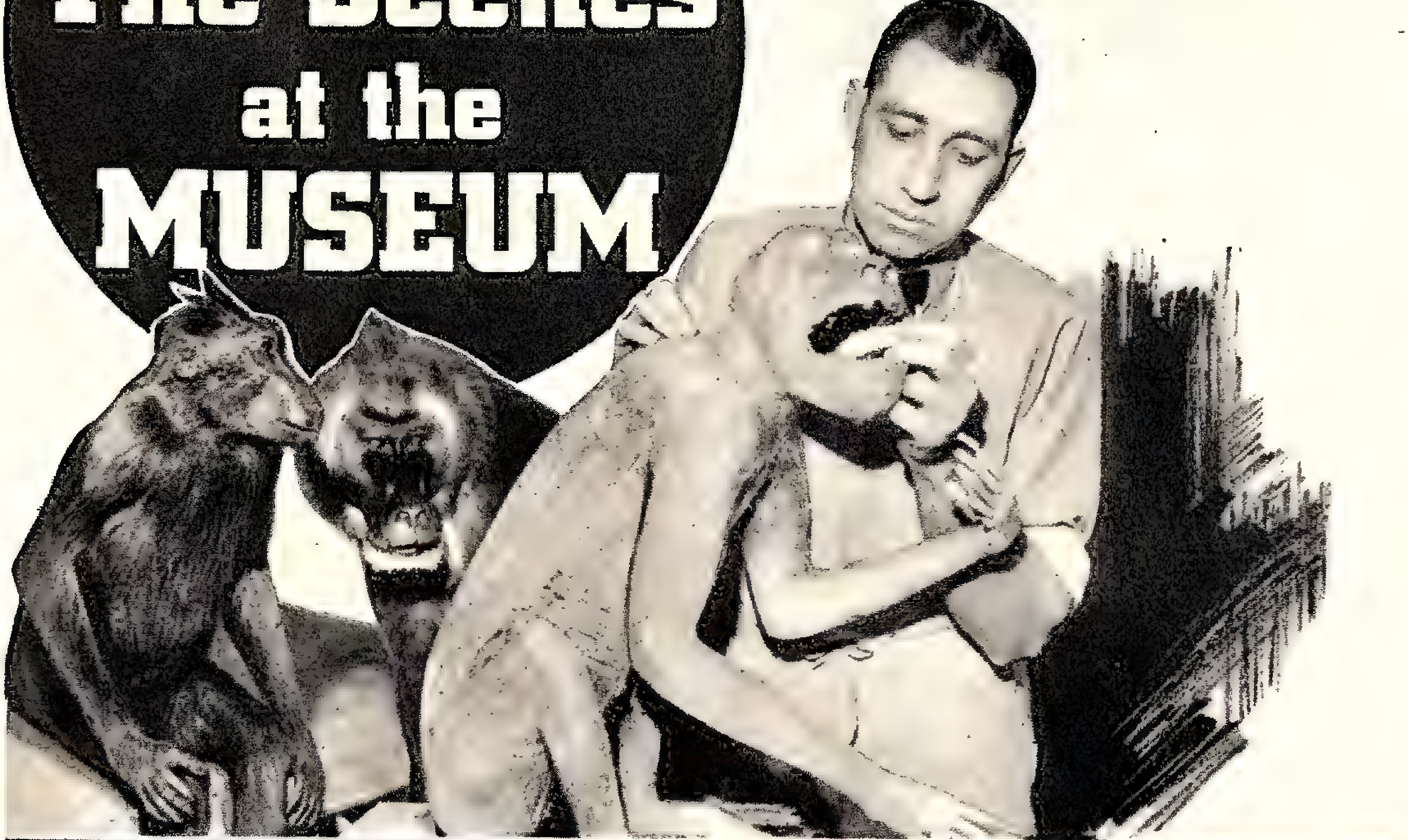
Working Steam Roller Model Pulls Two Persons On Cart



STANDING only ten and three-quarter inches high with an overall length of 20 inches, a working scale-model of a steam roller constructed by C. Hollandtrick, of Lincolnshire, England, is claimed to be powerful enough to haul a small trolley seating two persons. The model weighs 26 pounds and was constructed at a cost less than five dollars. A coal fire being impractical on such a small model, the water is heated by means of a paraffin burner to create a steam pressure of approximately 40-45 pounds per square inch in the broiler.

BEHIND The Scenes at the MUSEUM

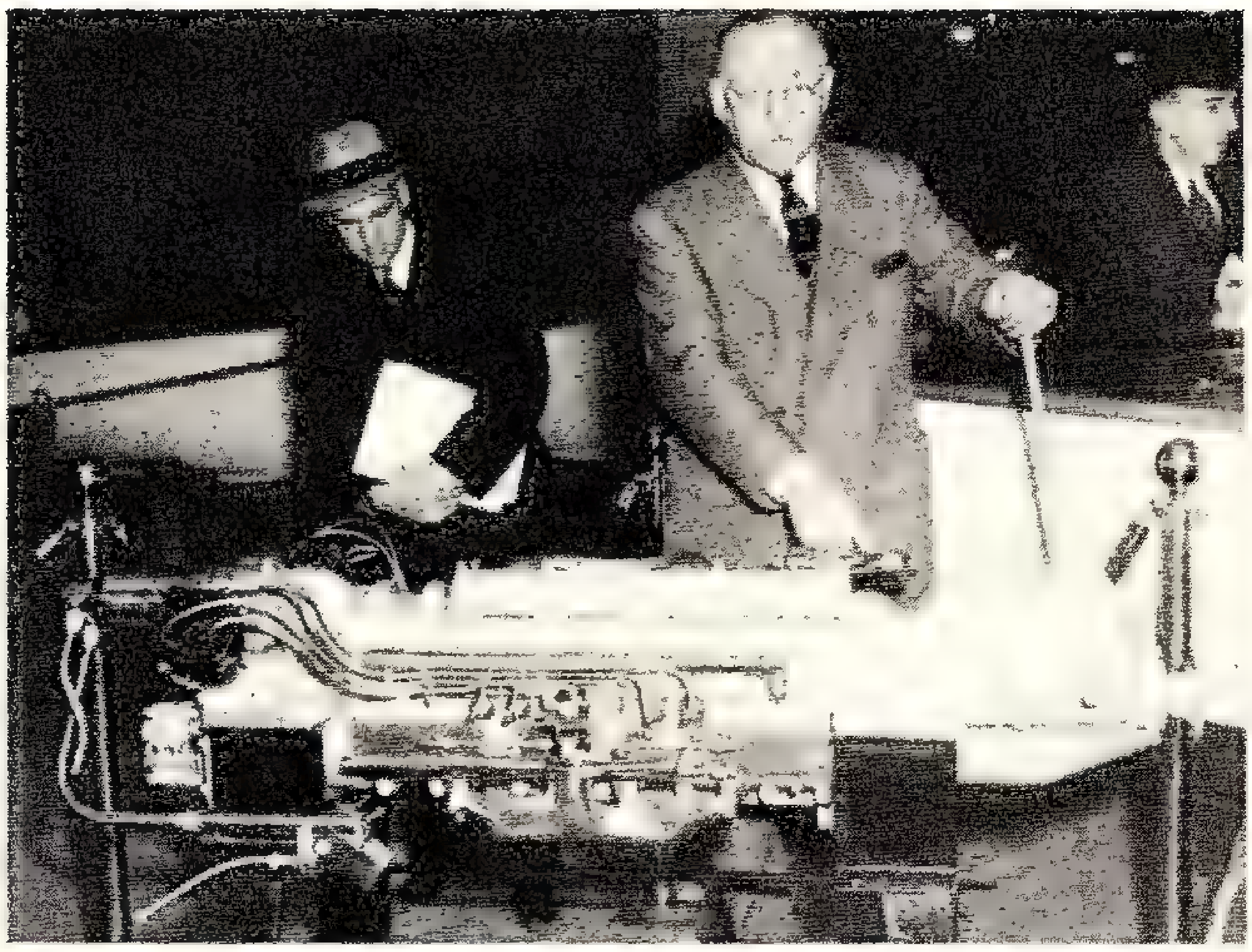
Shown below is taxidermist W. E. Eigsti, fitting teeth in a manikin of an African dog-faced baboon which, when completed, will appear as life-like to museum visitors as the black ape and drill specimens posed naturally at his side.



A wealth of detail and painstaking "behind the scenes" labor is involved in preparing museum exhibits before they are placed on public view to elicit such expressions as "How natural!" and "How life-like, one would almost think they were alive!" from scores of museum visitors. The photos on this page show exhibits being prepared by taxidermists at the Field Museum of Natural History in Chicago, Ill. In the photo above, a taxidermist is putting the finishing touches on seal specimens that were collected by Admiral Byrd's last Antarctic Expedition. The photo at lower left shows staff workers completing a specimen of a giant Tibetan panda, while in the center photo other staff taxidermists are touching up a marine exhibit made from cellulose-acetate compound.

Gasoline Turbine Engine Perfected For Marine Use

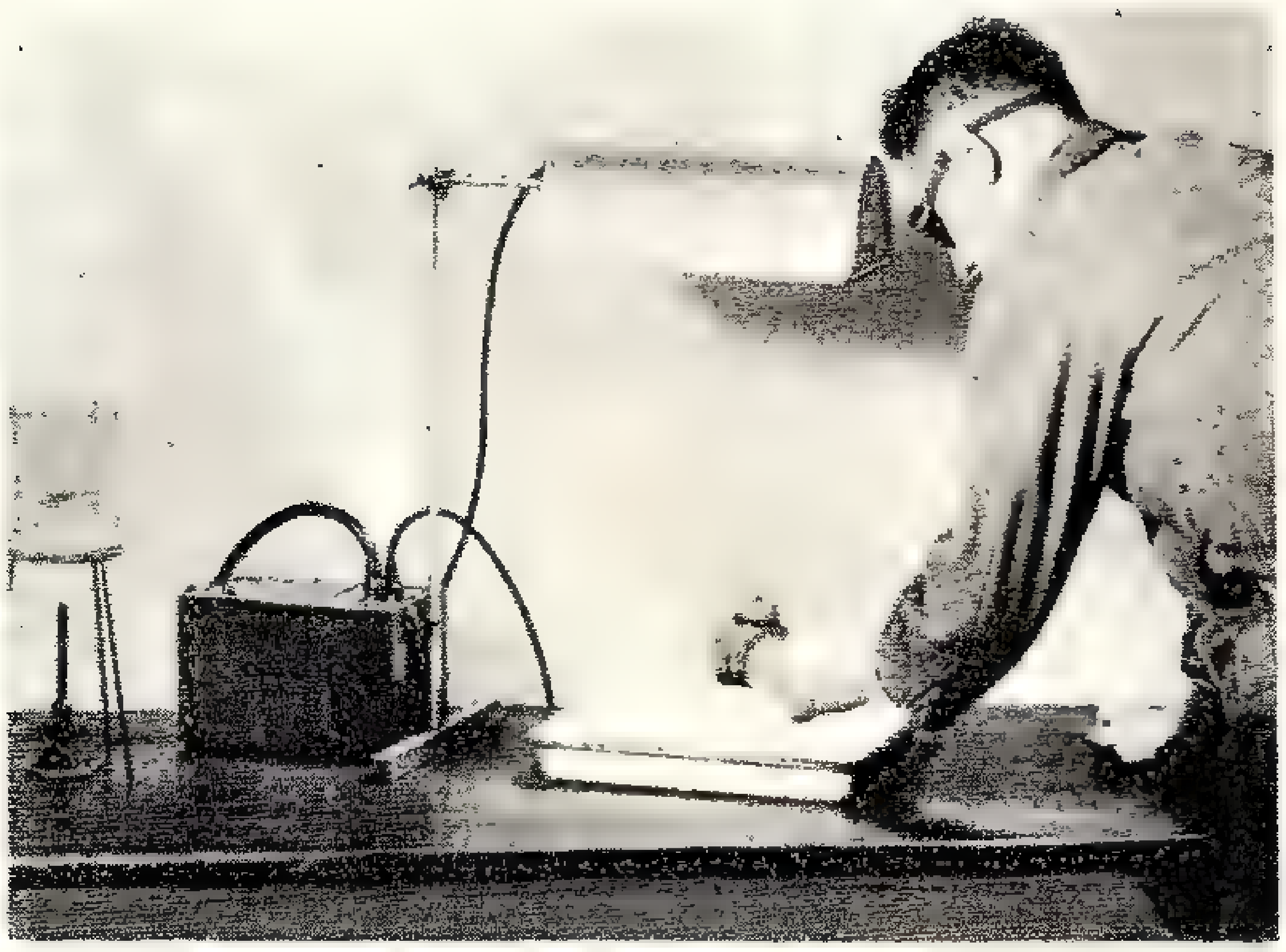
DESIGNED for marine use and developing 125 horsepower, a newly invented internal combustion turbine, which was recently placed on exhibition in New York, N. Y., features eight firing chambers and fires twice to each revolution of the crankshaft or four times as much as an ordinary gasoline engine. The engine is water cooled and weighs about 400 pounds, although a much lighter type is being developed for aviation use.



Developing 125 horsepower, this new marine gasoline turbine features firing and compression rotors instead of pistons and fires four times as much as an ordinary gasoline engine.

The gasoline turbine engine has five rotors mounted directly on a straight shaft, three rotors being of a compression type, while two are combustion rotors. Compression is caused by a cam action which is integral with the rotors, the firing and expansion directed on the rotor cam serving to eliminate the use of pistons. The firing rotors are cooled by water flowing through the shaft. The oil system is of the force-feed type.

New Ultra-Violet Ray Source



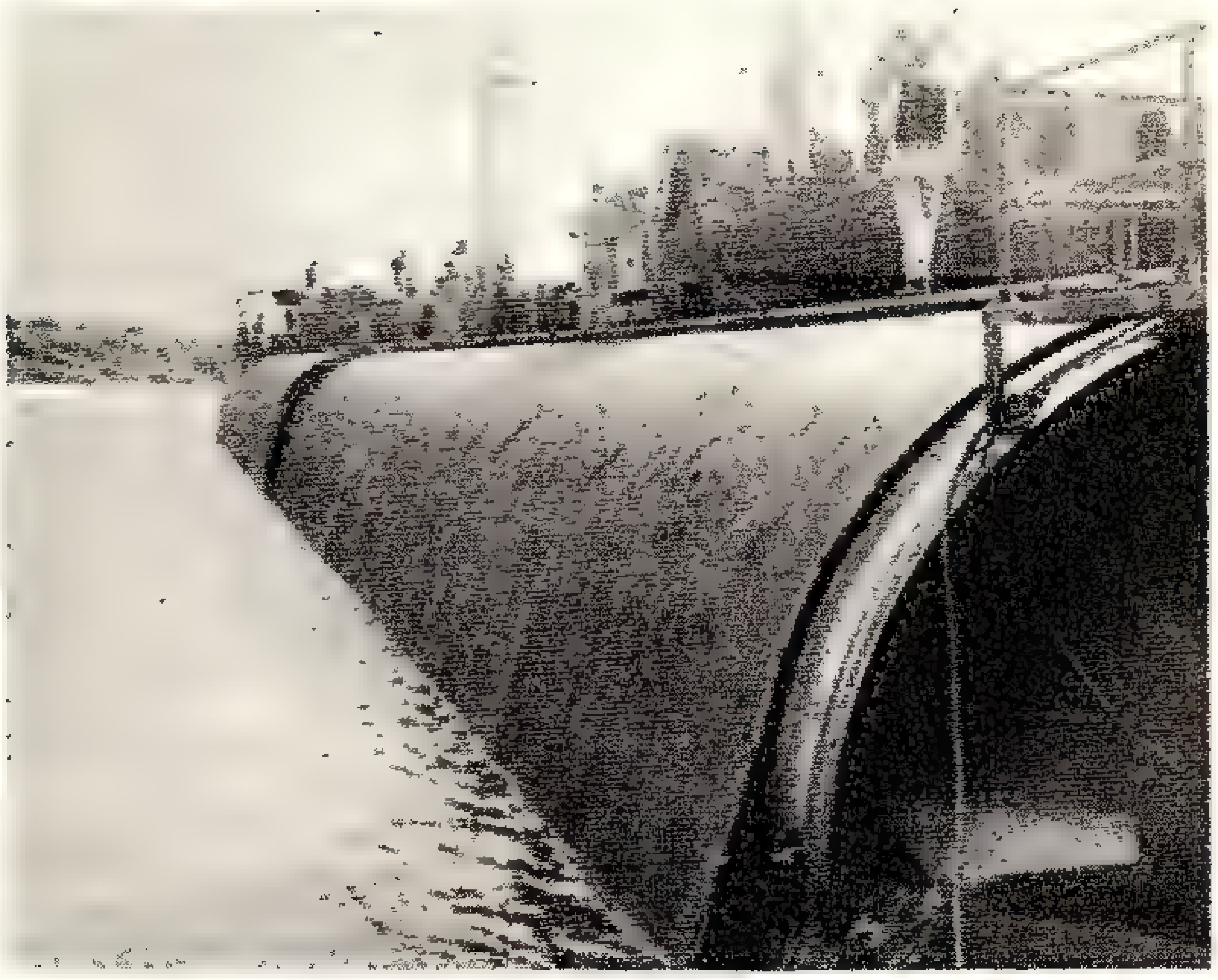
The adjustable mounting of this new ultra-violet ray lamp enables the operator to direct the radiations where desired.

A NEW, highly flexible source of ultra-violet radiation, consisting of a quartz-tube mercury vapor arc of improved efficiency mounted within a special reflector on a portable laboratory stand, has been developed by a well known electrical products manufacturer. The sealed mercury vapor tube unit, which can be operated from any 120-volt or 220-volt A.C. line, has a rated operating life exceeding 2,000 hours.

Engineers Pave River Bed

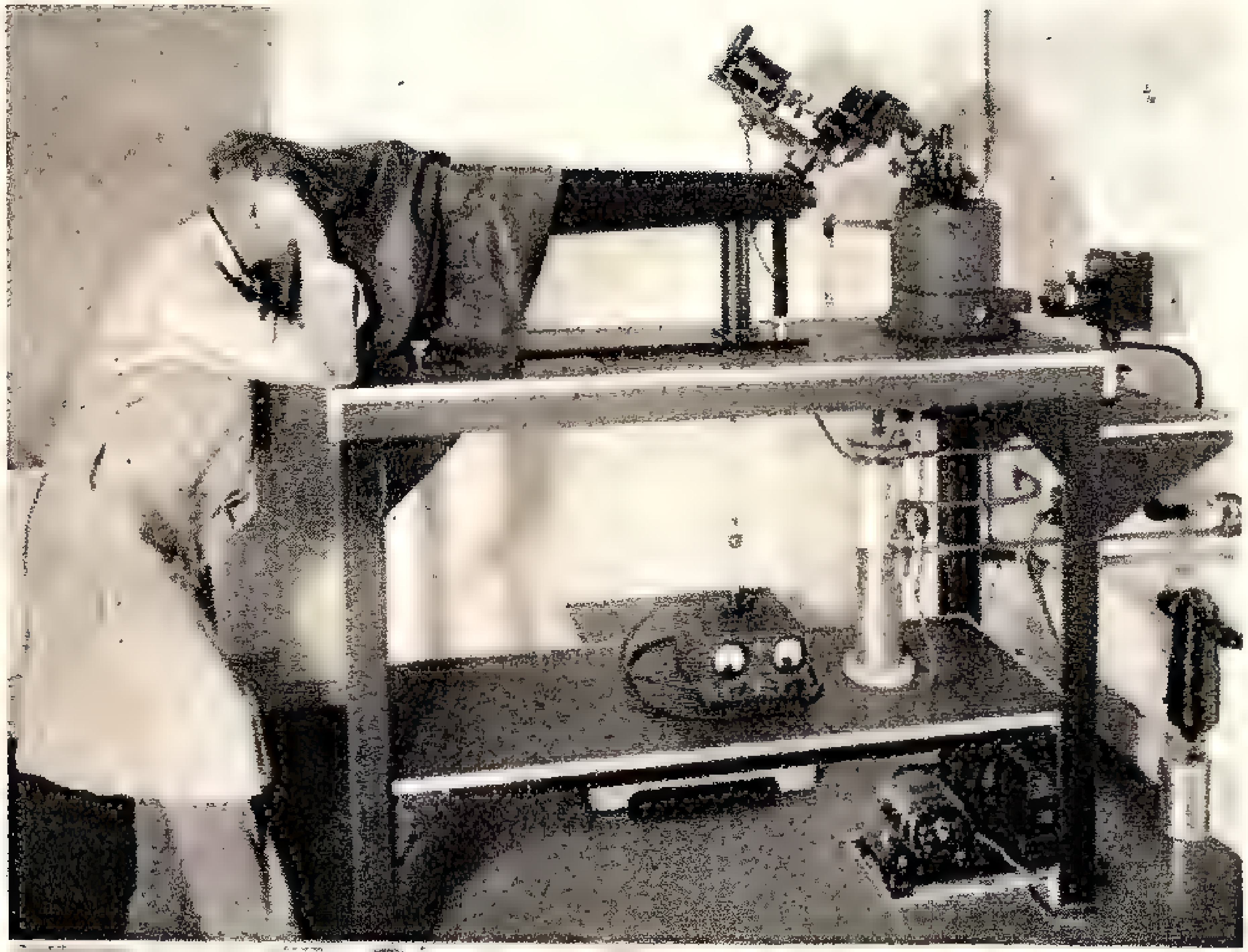
AS PART of an extensive flood control program costing one million dollars, United States Army engineers are paving the banks and bottom of the Mississippi River in the lower valley region of Louisiana with huge sheets of asphalt. The pavement is expected to prevent erosion and under-cutting of the river banks due to the pressure of the water during periods of flood.

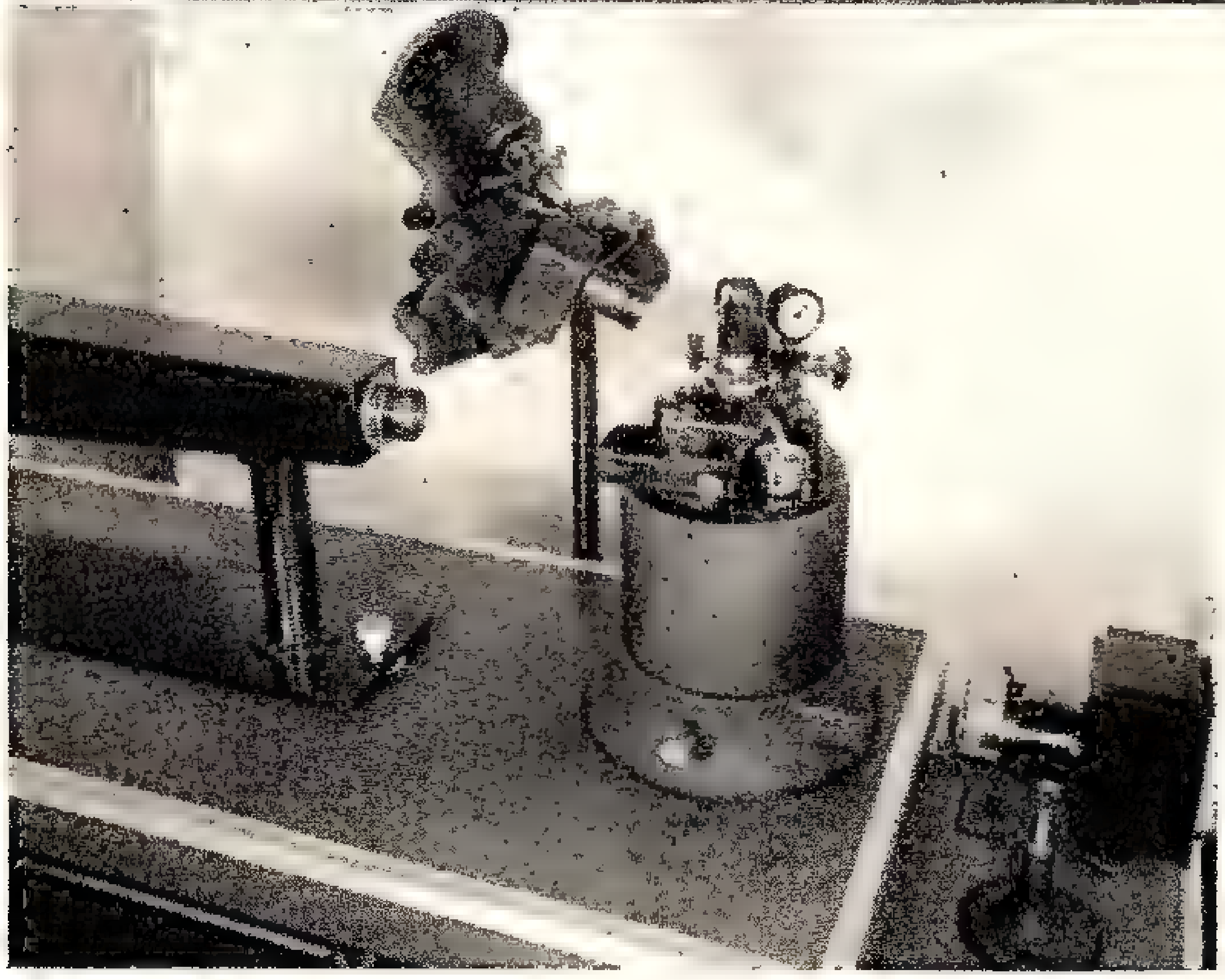
The asphalt sheets are prepared aboard barges and, when cooled to the proper temperature, are placed in position by moving the barge out into the river as the sheets are gently lowered overboard.



Prepared aboard barges, asphalt sheets are being lowered onto the Mississippi River bottom (above) by U. S. Army engineers in an effort to prevent erosion caused by floods.

Apparatus Takes Photographs Of Invisible Particles





Top—This apparatus enables scientists to take photographs of minute particles which are invisible under a microscope. The lower photo is a close-up of the camera, stroboscope, centrifuge and lamp which are the main parts of the apparatus.

A NEWLY developed scientific apparatus enables photographs to be taken of minute particles of matter which are invisible when viewed through a microscope. Although used primarily in the medical field, the apparatus is said to have many industrial uses.

The apparatus features a rotor on which the sample matter is revolved at high speed to develop a centrifugal force of 250,000 times gravity, separating the particles, and a stroboscope which rotates at 80,000 r.p.m. An electric lamp and a camera are used in conjunction with the apparatus to obtain a permanent record of the centrifuged particles.

Scale Device Tests Peaches

A DEVICE for testing the ripeness of peaches has recently been developed by the New Jersey Agricultural Bureau Experiment Station. Heretofore, the degree of ripeness has been determined mainly by guesswork, but the new pressure tester enables the determination to be made scientifically and accurately.

The tester is equipped with a sharp-pointed plunger and when the point is pushed into the peach the pressure necessary to penetrate it is registered on a specially calibrated scale.

Pushed into a peach, this scientific tester has a calibrated scale that accurately indicates the ripeness of the fruit.

Constructs Novel Altimeter

A UNIVERSITY of Michigan glider enthusiast has invented an ingenious "home-made" rate of climb indicator for soaring fans. A thermos bottle, a glass U-tube, glass tubing and a calibrated scale constitute the device described by its inventor, L. D. Montgomery.

Water and a small "leak" are the essential features of the instrument. Changes in atmospheric pressure, which are proportional to the height of the plane, are registered by changes in the height of water in the U-tube. This device, essentially an altimeter, is converted into a rate of climb indicator by controlling the flow of water by means of the "leak," a fine capillary tube from the thermos bottle. The thermos bottle is used to minimize changes in the temperature of the water.

Miniature Home Features 35 Furnished Rooms

THIRTY-FIVE completely furnished rooms, in periods, are featured in a novel Lilliputian home recently placed on exhibition in Los Angeles, Calif., at a benefit staged to aid underprivileged children. The furnishings for the rooms were made from materials gathered from all over the world, collected and arranged for the exhibition by Mrs. Elizabeth W. Larke.

An outstanding feature of the tiny home is a grand staircase, less than four feet overall, which was constructed from an ivory fan, a tortoise shell bird cage and wood from an old walnut bed. Many of the rooms contain carved ivory statues and priceless miniature pictures. Chandeliers made from earrings and bedsteads made from fan sticks and lemon forks, as well as 25,000 other odds and ends, comprise the furnishings.

This photo shows only a few of the 35 completely furnished rooms featured in a novel miniature home recently exhibited in Los Angeles. Some of the tiny decorations are priceless. The young lady is admiring one of the carved ivory statues.

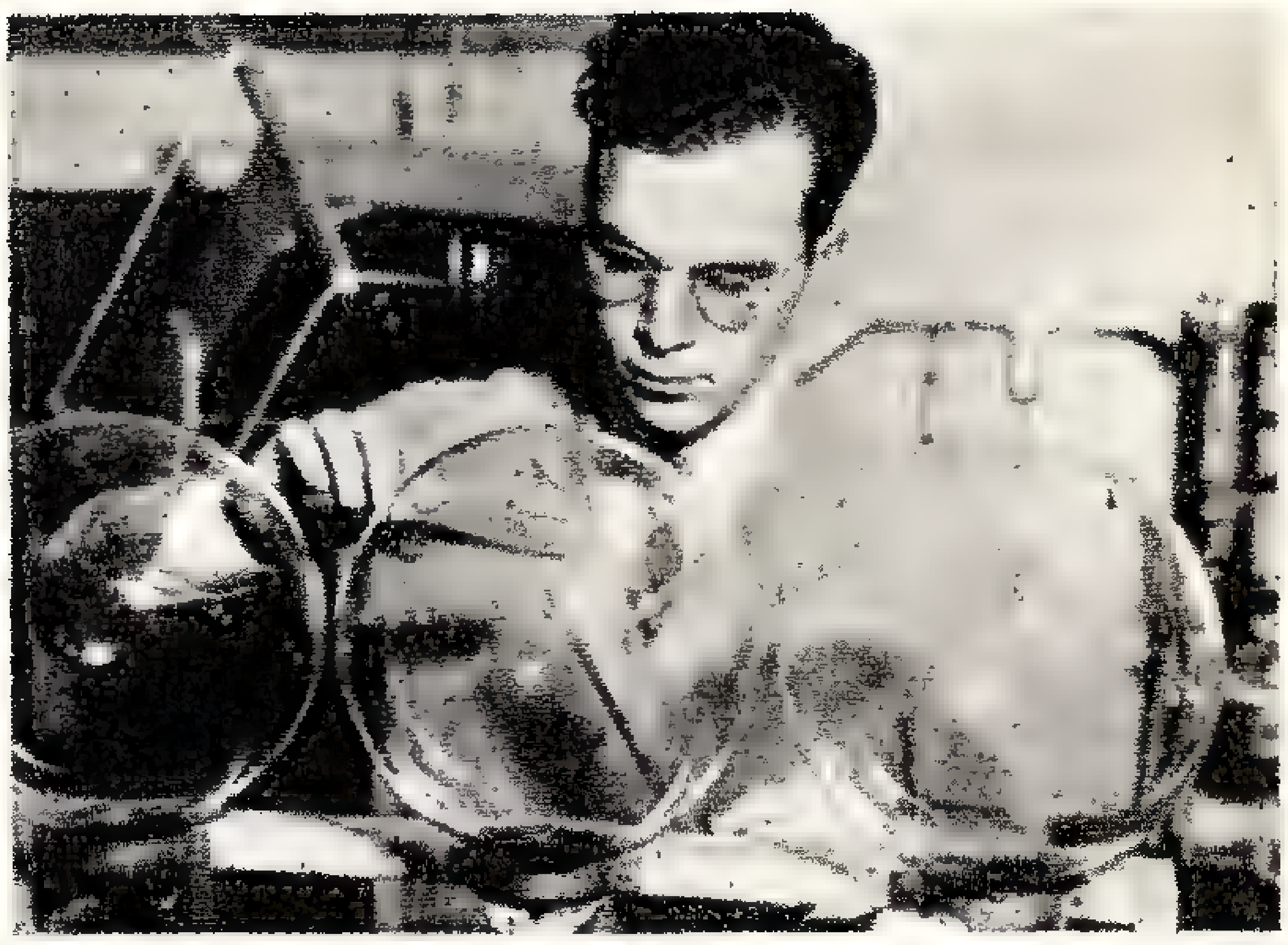
Hand Meter Tests Headlight

A Kansas highway officer tests the candlepower of an automobile headlight with a portable light-intensity meter.

WHETHER an auto's headlights are faulty, medium, correct or illegal can quickly be determined through the use of a new hand-carried intensity meter recently developed. The device is funnel-shaped so that it fits over the headlight glass in such a manner that a built-in diffusing plate directs the light rays into the meter, which is calibrated to show the candle-power produced by the headlight.

Student Develops Explosive

WENDELL ZIMMERMAN, 24-year-old post-graduate student at the University of California, is said to have discovered a formula for making a new explosive that is 53 times more powerful than TNT. Known only as RPX, the new explosive will be used in inter-planetary rocket experiments, according to Zimmerman.



Conducting chemical experiments, Wendell Zimmerman discovered a formula for an explosive more powerful than TNT.

TUNING UP THE OUTBOARD

Ardent fishing enthusiasts are "boosters" of the outboard engine because it enables them to visit widely separated fishing grounds within minimum time.

IF YOU, like thousands of other sensible outboard motor owners, stored your motor away last winter in accordance with the clearly printed instructions that were supplied with the engine at the time of its original purchase you need only observe a few simple, common sense "tuning up" rules *now* in order to insure maximum efficiency throughout the dawning boating season.

The first step is to go over the entire motor, tightening all screws and nuts. If a screw does not seat properly, do not force it, but unscrew it. Then, after dipping the screw in some heavy oil, try rescrewing again, making sure that you have engaged the threads properly.

Remove the spark plugs and squirt some clean gasoline into the spark plug holes. Pull the motor over by means of the starter rope until the oil that was placed in the cylinders during the winter has been pretty well removed.

Check the spark plugs for breakage and adjust the gaps according to the manufacturer's specifications. Test the plugs to see if they are delivering a good spark by attaching each plug, in turn, to a spark plug wire (grounding one wire in the case of two, or more, cylinder types) and turning over the engine to see if a "hot" spark appears across the plug points.

In the event you do not get a good spark, remove the entire magneto assembly and check all wires for breakage. The coil can be given a protective coating of water-proof varnish at the same time.

Take the carburetor apart, as explained in the manufacturer's instruction booklet (if you lost yours, you can obtain a new one from the manufacturer at a nominal cost), and remove all dirt and oil.

Replace the gasket if necessary, as indi-

MOTOR

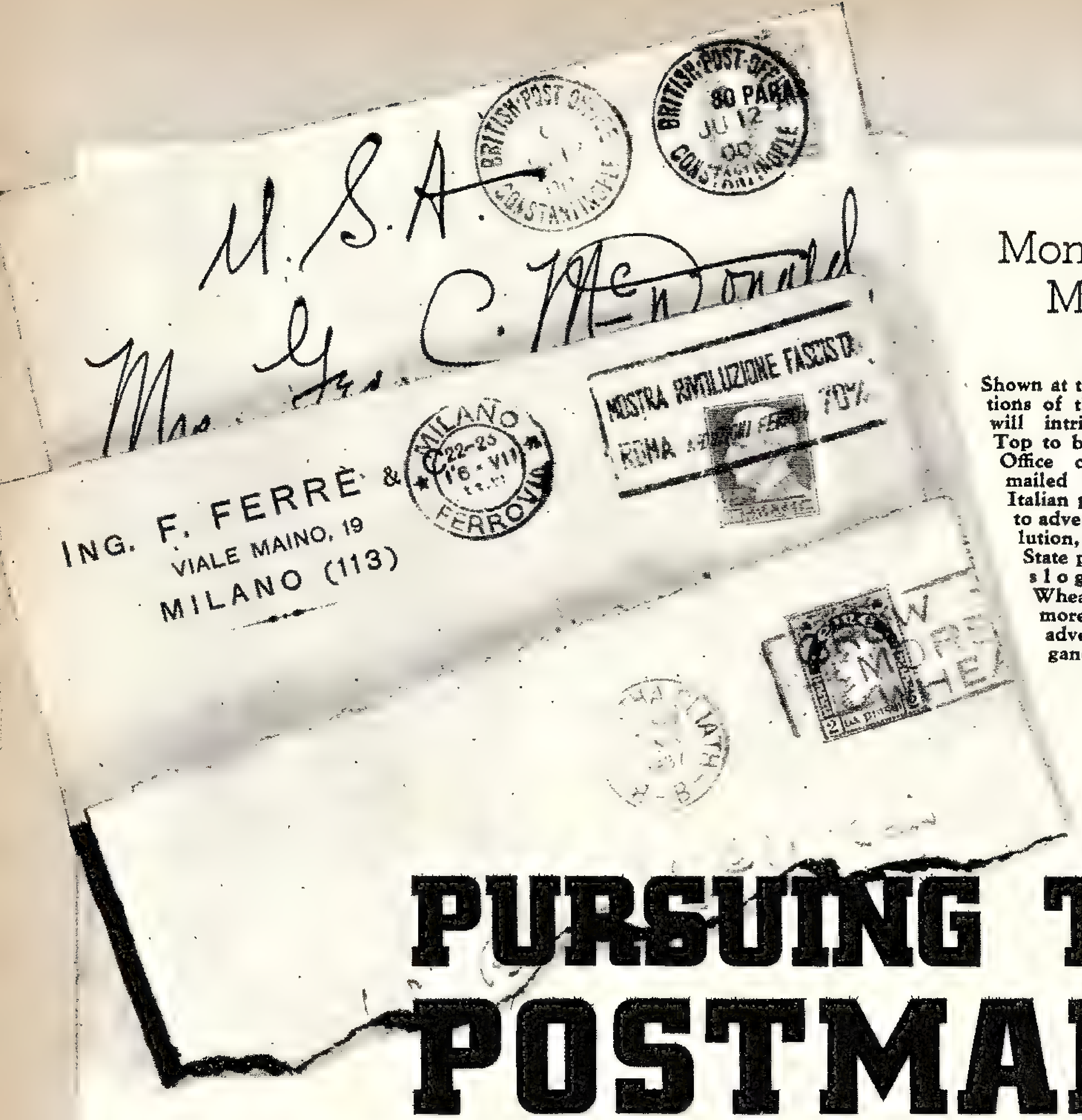
cated by breakage or a dried out appearance.

Clean out all old grease from the gear housing, wash the housing in gasoline and check the gears for breakage. Refill the housing with grease recommended by the manufacturer. (This is probably the most important of all pre-season precautions).

Having tightened all screws and nuts, checked the plugs, magneto, coil, etc., as well as cleaned the carburetor and refilled the gear housing, you are ready to mount the motor on your boat.

Start the engine in the usual manner, making certain that water is running through the pump within a few seconds or the cylinders will crack from the heat. Carefully adjust the carburetor until you are getting maximum efficiency and smooth running. Don't "go off the handle" if the engine does not run smoothly at first, but check over all parts systematically until you locate the trouble. "Losing your head" won't get one single r.p.m. out of the engine. Modern outboards are practically fool-proof and when they do break down it can usually be traced to abuse by the operator.

The knowledge that the outboard motor will eliminate the tiring job of rowing back to camp helps to make the fisherman's day more enjoyable (top) and enables the followers of Izaak Walton to linger at the choice spots until the last possible moment without fear of missing "chow." Above—Hunters, too, find the outboard to their liking for there is nothing like the powerful "putt-putts" when it comes to traveling upstream in a boat loaded with hunting and camping equipment.



by Montgomery Mulford

Shown at the left are reproductions of three postmarks that will intrigue any collector. Top to bottom—British Post Office cover which was mailed from Turkey; an Italian postmark that served to advertise the Facist Revolution, and an Irish Free State postmark bearing the slogan—"Grow More Wheat". Each year more and more nations advertise and propagandize by postmark.

PURSUING THE POSTMARK

POSTMARK collecting has a number of attractive features. First of all, a number of them being elusive results in a chase which adds to the collector's interest. Second, many postmarks are rarer than the stamps, so that they are well worth seeking. And third, the postmark shows that a letter and its stamp have done postal duty.

There are many groups of postmarks to arouse the interest of the collector. The ones illustrated with this article picture some of the most interesting types. Growing more elusive, for instance, are the postmarks showing that a stamp did duty in the post office of one nation established in another. These postmarks are grouped as "offices abroad" and, in many instances, postage stamps of one country have been overprinted for such use. A pertinent example is shown in the illustration of the British Post Office cover which was mailed from Constantinople (now Istanbul), Turkey.

Various European nations have maintained postal services in other lands, these foreign offices within sovereign nations using their own postmarks and, often, their own stamps. Thus the British-Constantinople office used postage of Great Britain, surcharged with a Turkish value. Where the prepared stamp may be fairly common, a postmark of the type shown, is not usually met with, though not really rare.

Since these postmarks are not as common as the stamps in the "offices abroad" group, the chase for the items is in itself interesting. When one finally attains such a postmark, especially upon full cover, it is felt that the chase has been well worth the effort put forward. The pursuit of the postmark is fascinating, and might be likened to a game. The more elusive one postmark may be, the greater is its fascination.

Quite often postmarks are of historical interest, in more ways than one. The "offices

[*Continued on page* 130]

CRAFTS and HOBBIES

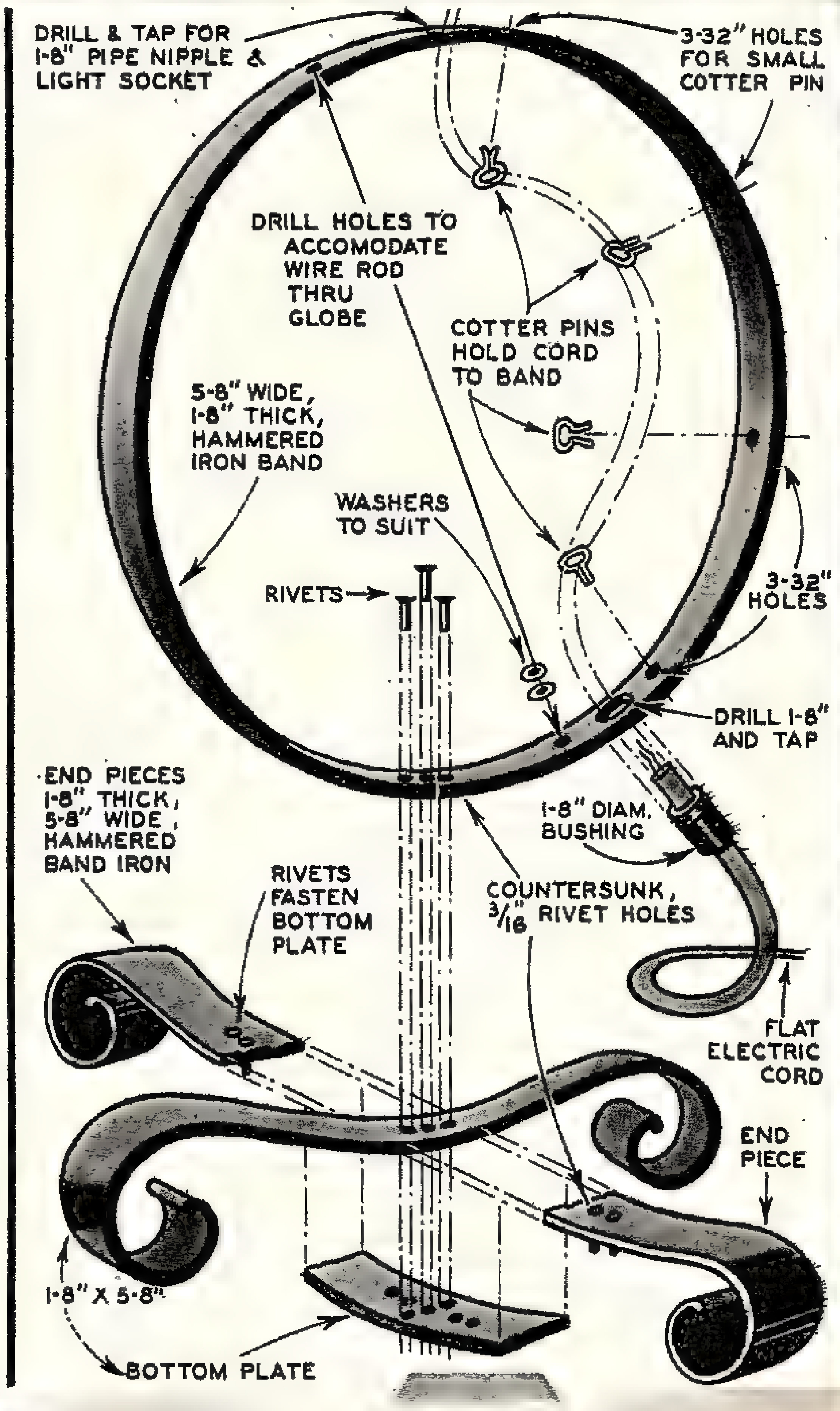
A WROUGHT IRON GLOBE LIGHT

by George A. Smith

THE beauty of this wrought iron combination of lamp and globe lies in the contrasting colors of the dull gray hammered iron with the more or less vivid colors of the land and water areas on the globe.

Before beginning the iron work a globe should be purchased. The lamp illustrated contains a 7-inch globe which costs less than a dollar. If a globe larger or smaller is used,

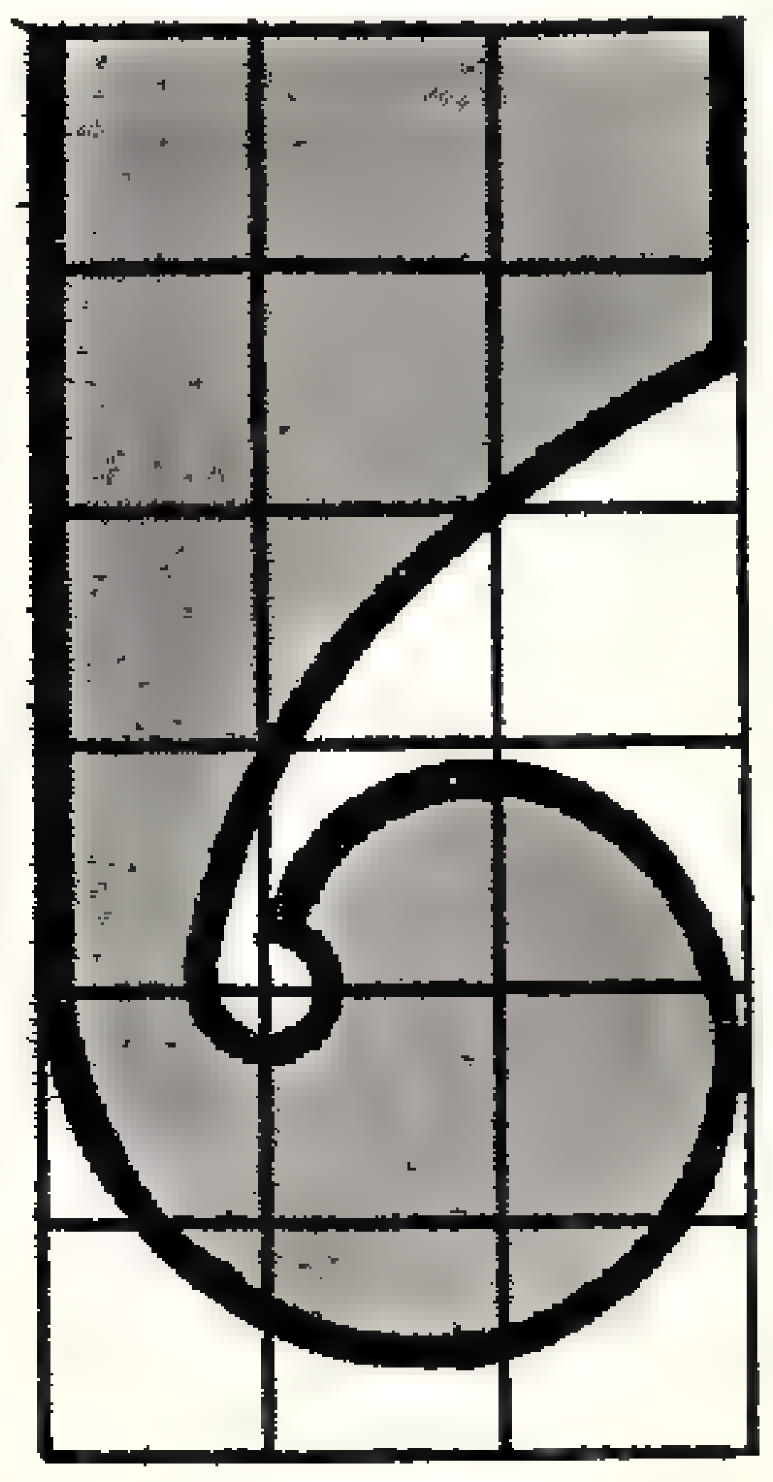
[*Continued on page* 126]


DRILL & TAP FOR 1-8" PIPE NIPPLE & LIGHT SOCKET
3-32" HOLES FOR SMALL COTTER PIN
DRILL HOLES TO ACCOMODATE WIRE ROD THRU GLOBE
COTTER PINS HOLD CORD TO BAND
5-8" WIDE, 1-8" THICK, HAMMERED IRON BAND
WASHERS TO SUIT
3-32" HOLES
RIVETS
DRILL 1-8" AND TAP
END PIECES 1-8" THICK, 5-8" WIDE, HAMMERED BAND IRON
1-8" DIAM. BUSHING
RIVETS FASTEN BOTTOM PLATE
COUNTERSUNK, 3/16" RIVET HOLES
FLAT ELECTRIC CORD
END PIECE
1-8" X 5-8"
BOTTOM PLATE

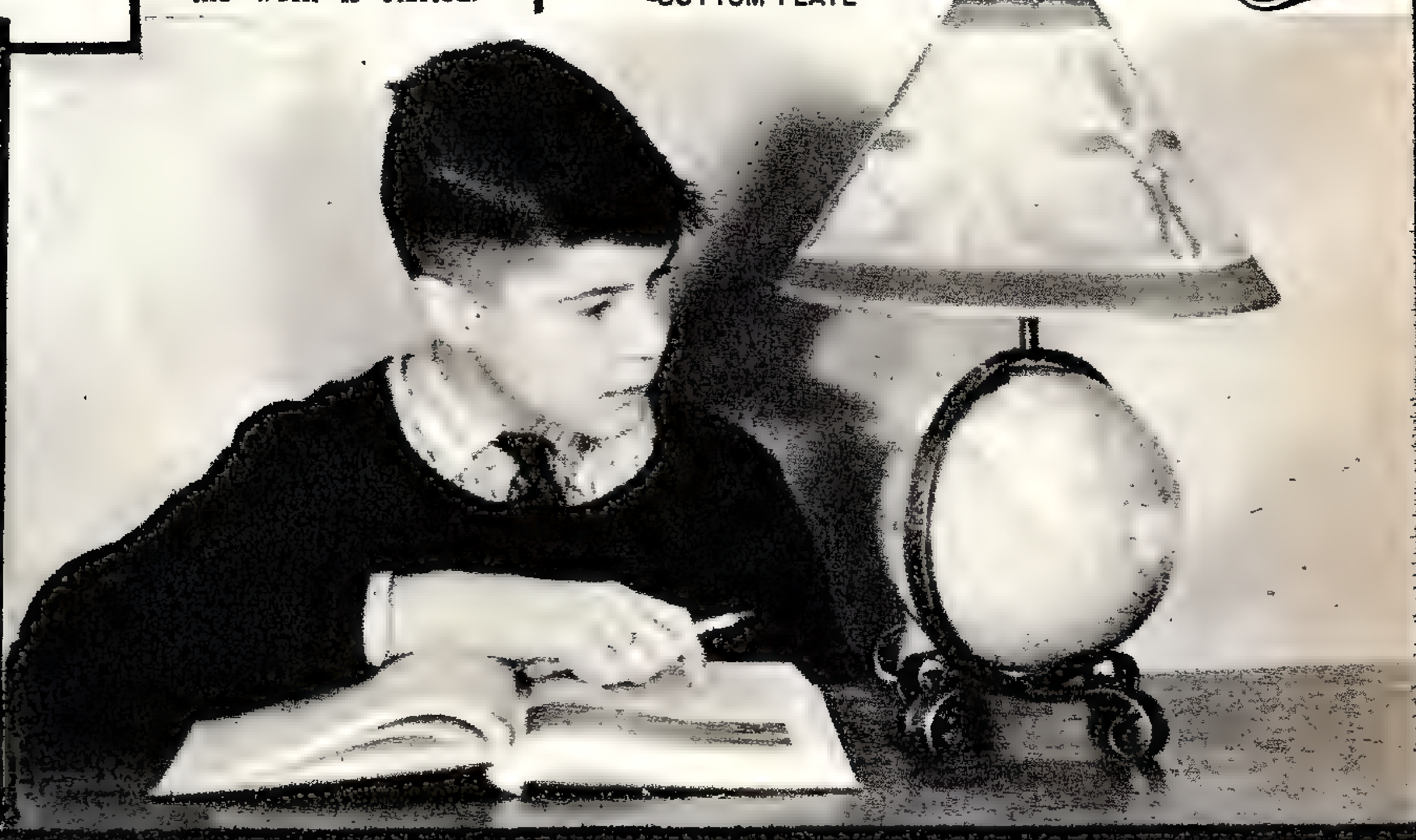
This attractive globe-lamp can be made easily and quickly. The work will be simplified if the builder will study the constructional data carefully before the work is started.

FILE ENDS TO SHAPE

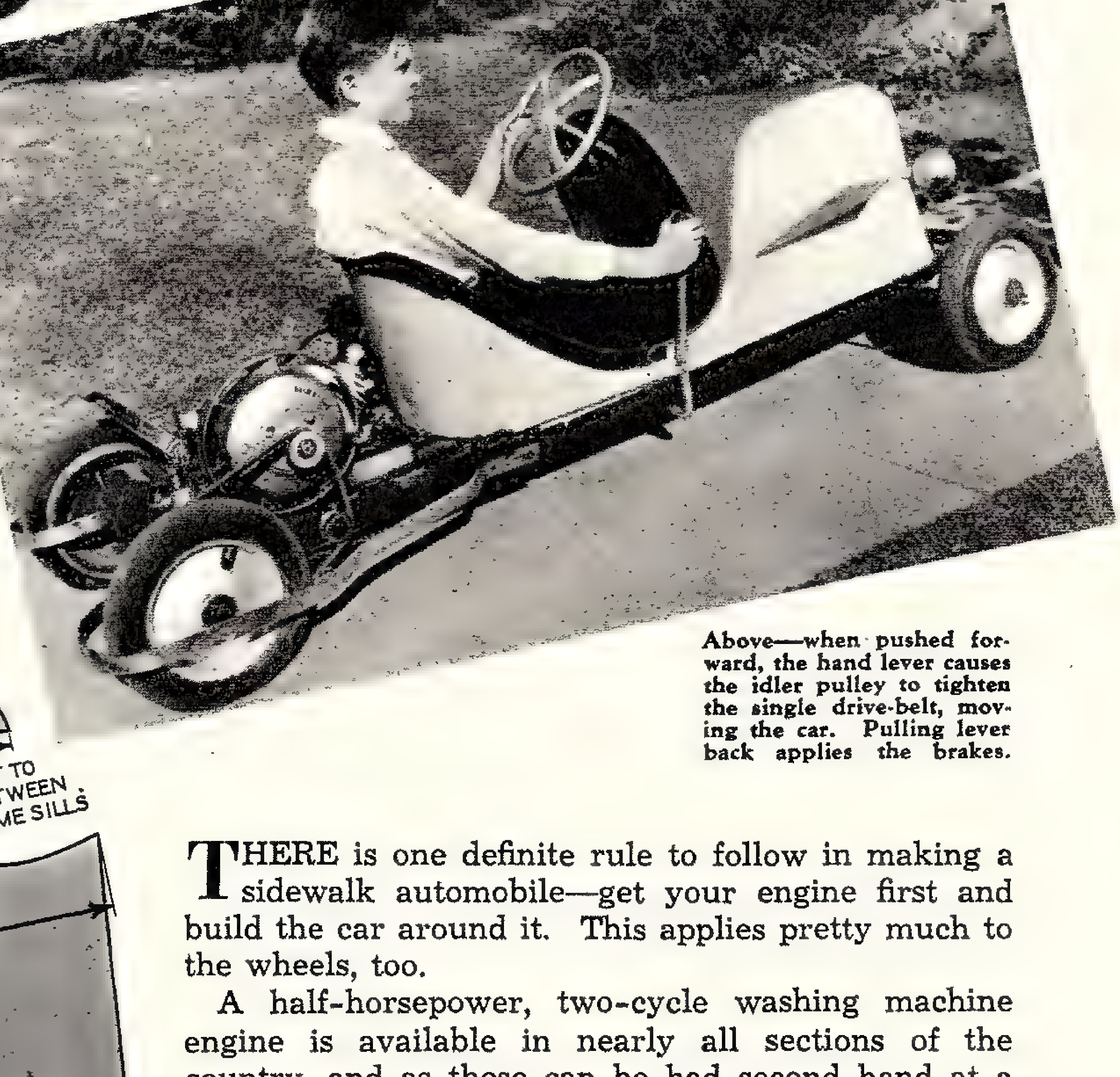
1" SQUARES



PATTERN FOR SCROLL



This SIDEWALK RUNABOUT



Head on, the "Weber Roadster" has a striking appearance. In the drawings below, the construction details of a simpler radiator and hood are shown.

Above—when pushed forward, the hand lever causes the idler pulley to tighten the single drive-belt, moving the car. Pulling lever back applies the brakes.

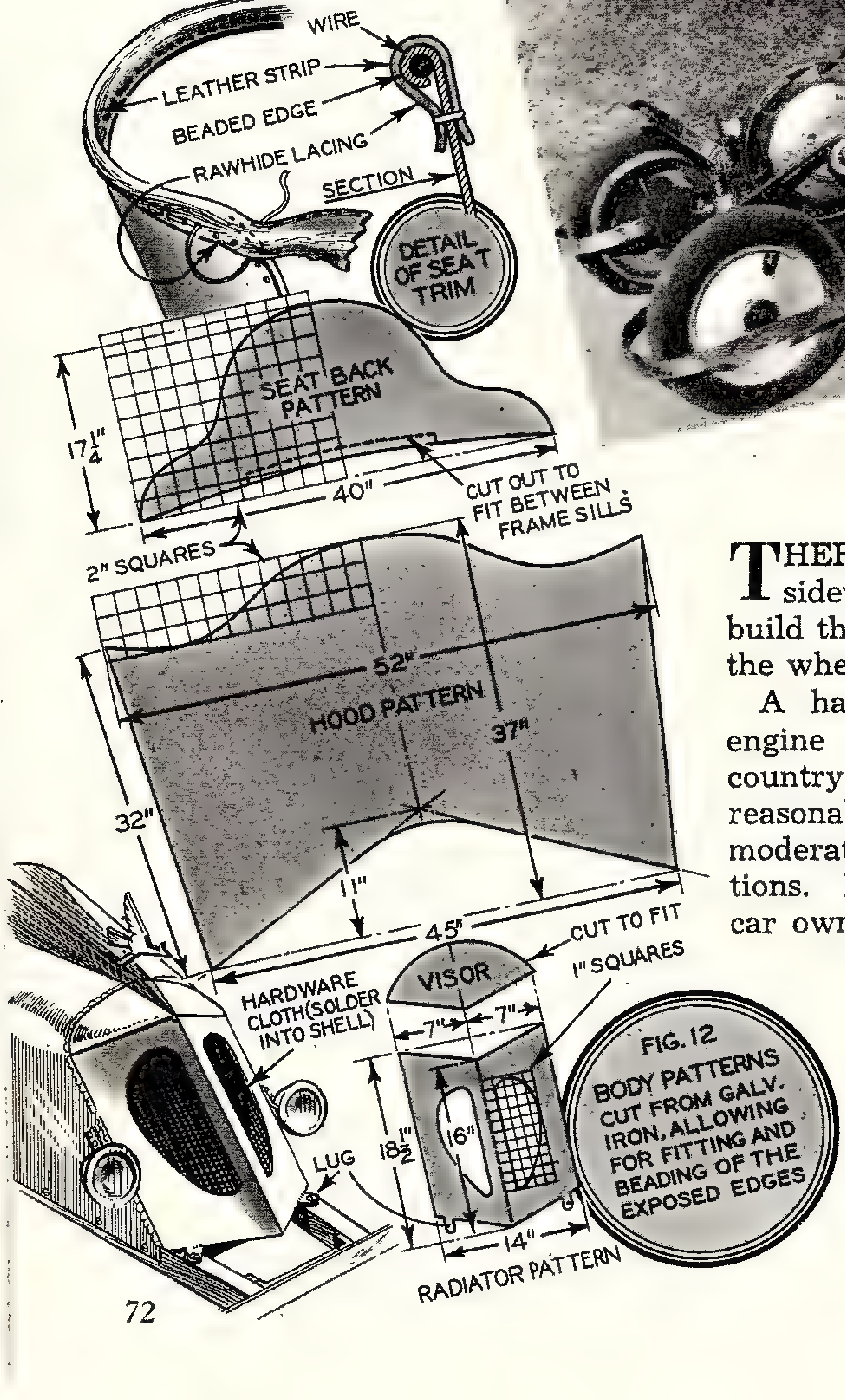

WIRE
LEATHER STRIP
BEADED EDGE
RAWHIDE LACING
SECTION
DETAIL OF SEAT TRIM
SEAT BACK PATTERN
17 1/4"
40"
CUT OUT TO FIT BETWEEN FRAME SILLS
2" SQUARES
52"
HOOD PATTERN
37"
32"
11"
45"
CUT TO FIT
1" SQUARES
VISOR
HARDWARE CLOTH (SOLDER INTO SHELL)
7"
7"
18 1/2"
16"
LUG
14"
RADIATOR PATTERN

FIG. 12 BODY PATTERNS CUT FROM GALV. IRON, ALLOWING FOR FITTING AND BEADING OF THE EXPOSED EDGES

THERE is one definite rule to follow in making a sidewalk automobile—get your engine first and build the car around it. This applies pretty much to the wheels, too.

A half-horsepower, two-cycle washing machine engine is available in nearly all sections of the country, and as these can be had second-hand at a reasonable price and have sufficient power for moderate speeds, they make satisfactory installations. Herewith are working drawings of the little car owned by Richard Weber, of San Marino, California, which is driven by this type of motor and has proved successful for a long period. It is very easy to build.

In Figs. 1, 2 and 3 are given the general over-all dimensions. Note that the front wheels have a wider tread than the rear. This permits a shorter turning radius, and brings the back wheels in close to the power unit. The engine is provided with

is Easy to Build

Left—The trim little runabout is powered by a washing machine motor of one-half horsepower, which enables the car to travel about 16 m.p.h., averaging 50 to 75 miles per gallon of gasoline. Motor is connected to one wheel by a drive-belt.

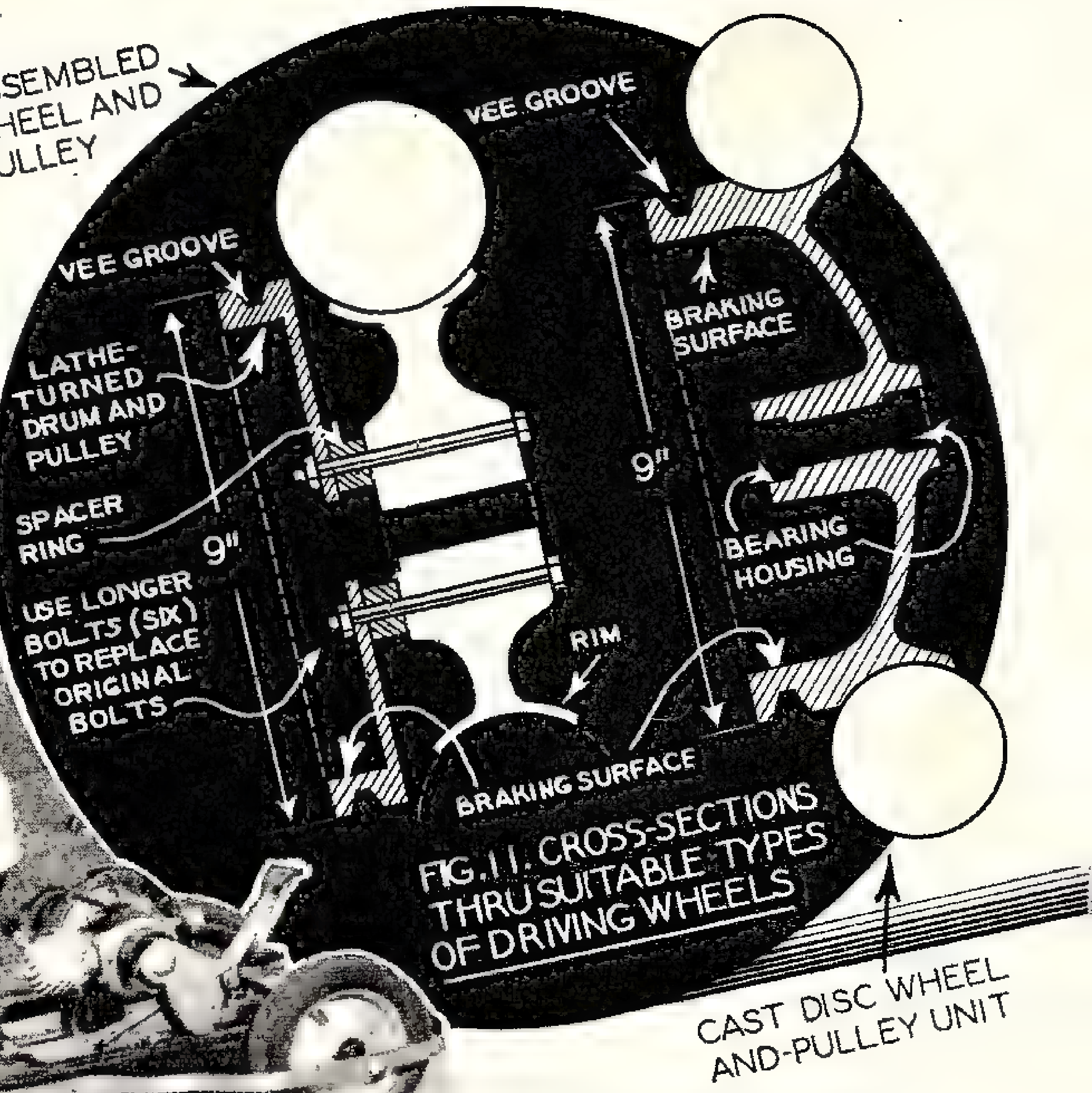
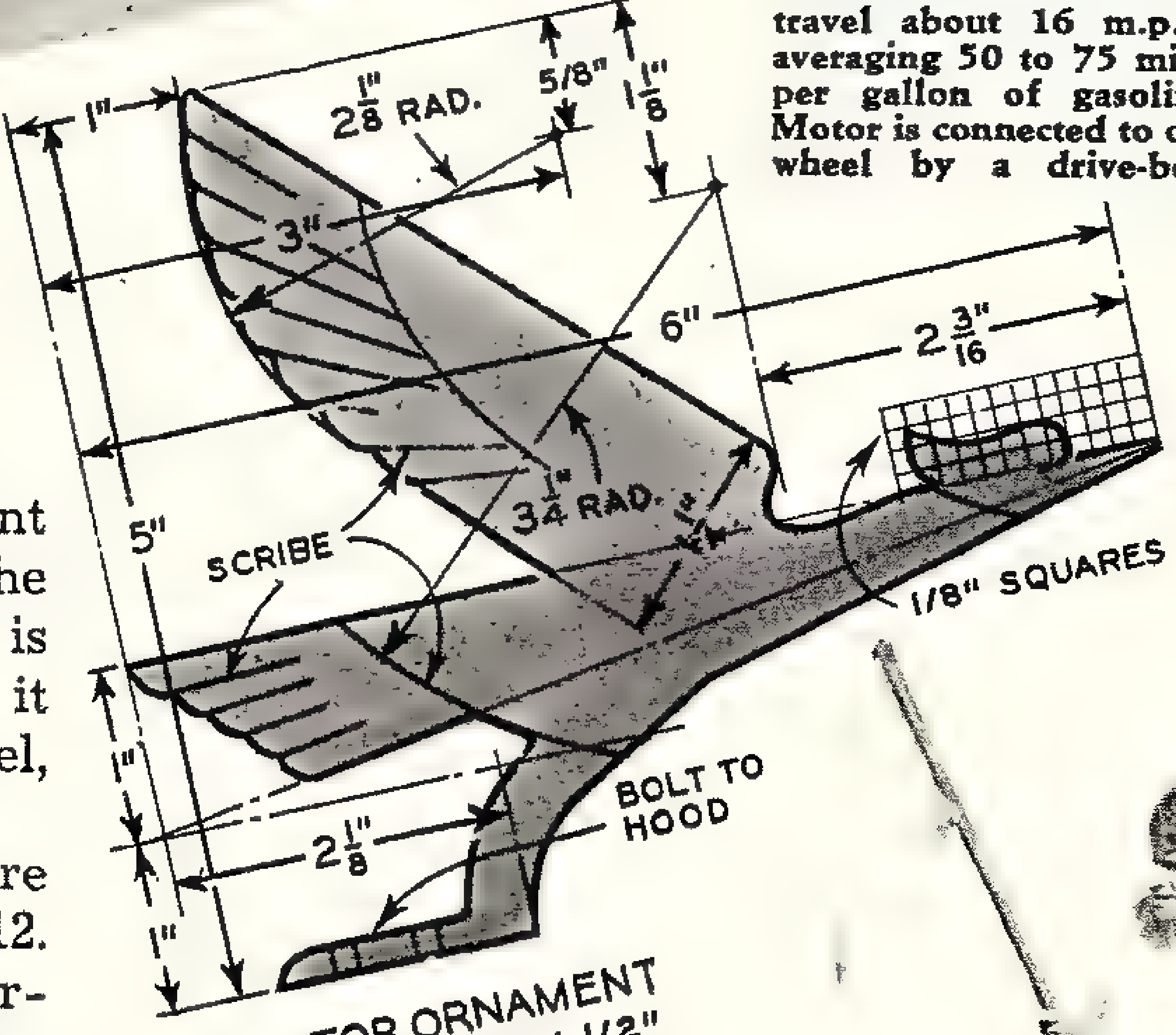

ASSEMBLED WHEEL AND PULLEY
VEE GROOVE
VEE GROOVE
LATHE-TURNED DRUM AND PULLEY
SPACER RING
9"
9"
USE LONGER BOLTS (SIX) TO REPLACE ORIGINAL BOLTS
BRAKING SURFACE
BEARING HOUSING
RIM
BRAKING SURFACE
CAST DISC WHEEL AND-PULLEY UNIT

FIG. 11. CROSS-SECTIONS THRU SUITABLE TYPES OF DRIVING WHEELS

by Hi Sibley

a kick starter, and the clutch arrangement consists of an idler pulley which tightens the single drive-belt when the hand lever is pushed forward. When pulled back, it operates the brake. Drive is on one wheel, brake on two.

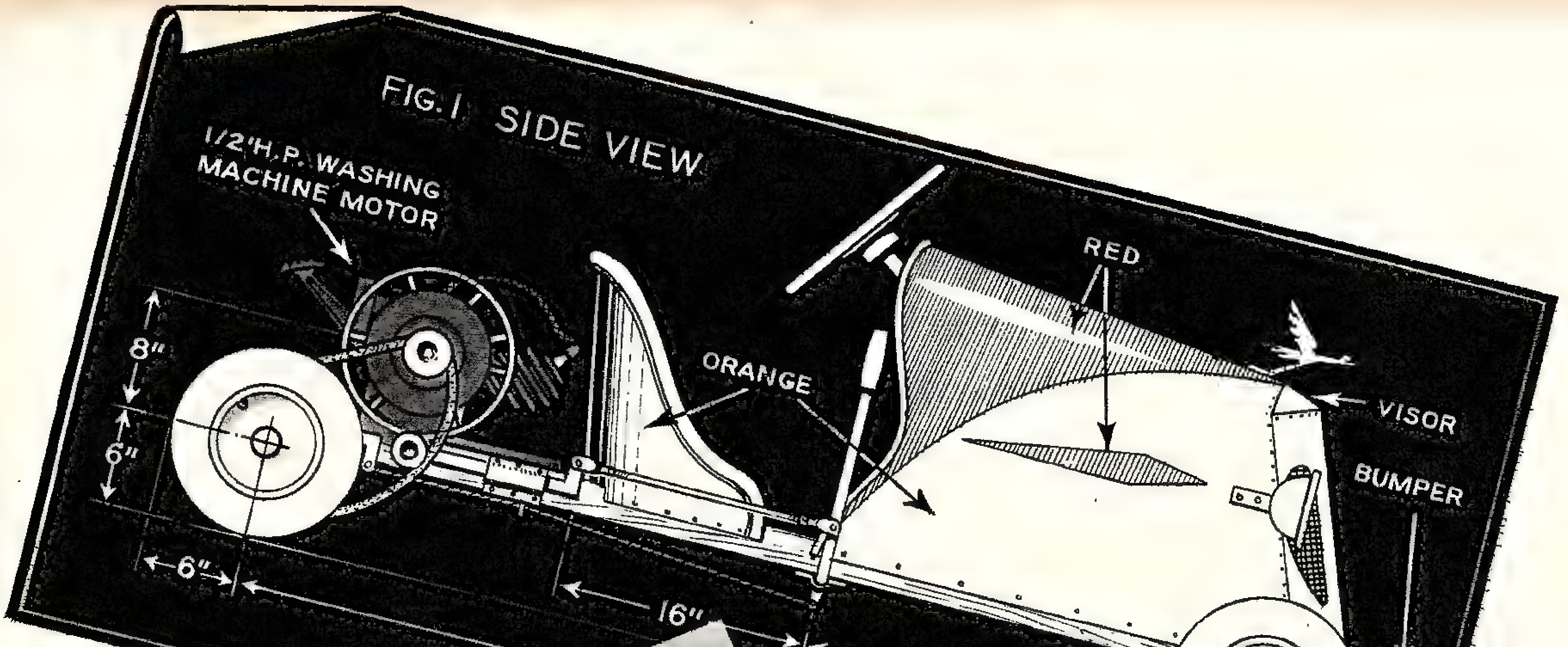
Hood, seat-back and dummy radiator are of galvanized iron cut as shown in Fig. 12. These dimensions are approximate as a certain amount of fitting is always necessary for curved members. If you have the facilities,

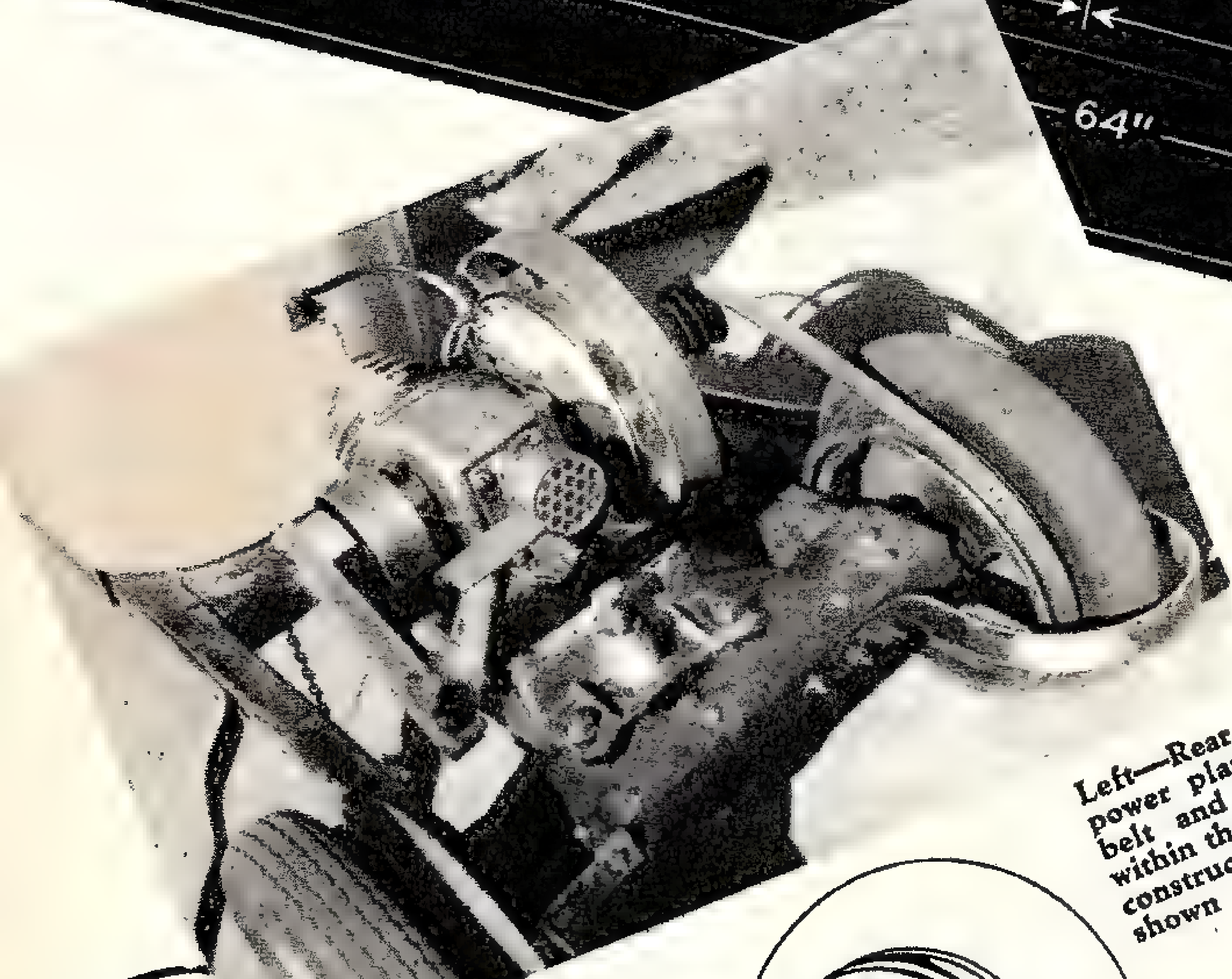

1"
$2\frac{1}{8}$" RAD.
5/8"
$1\frac{1}{8}$"
3"
6"
$2\frac{3}{16}$"
5"
SCRIBE
$3\frac{1}{4}$" RAD.
1/8" SQUARES
1"
$2\frac{1}{8}$"
BOLT TO HOOD
1"

RADIATOR ORNAMENT
SAW AND FILE FROM 1/2" ALUMINUM, AND POLISH

The start of a midget auto "race", with the Weber car in foreground of the lineup.

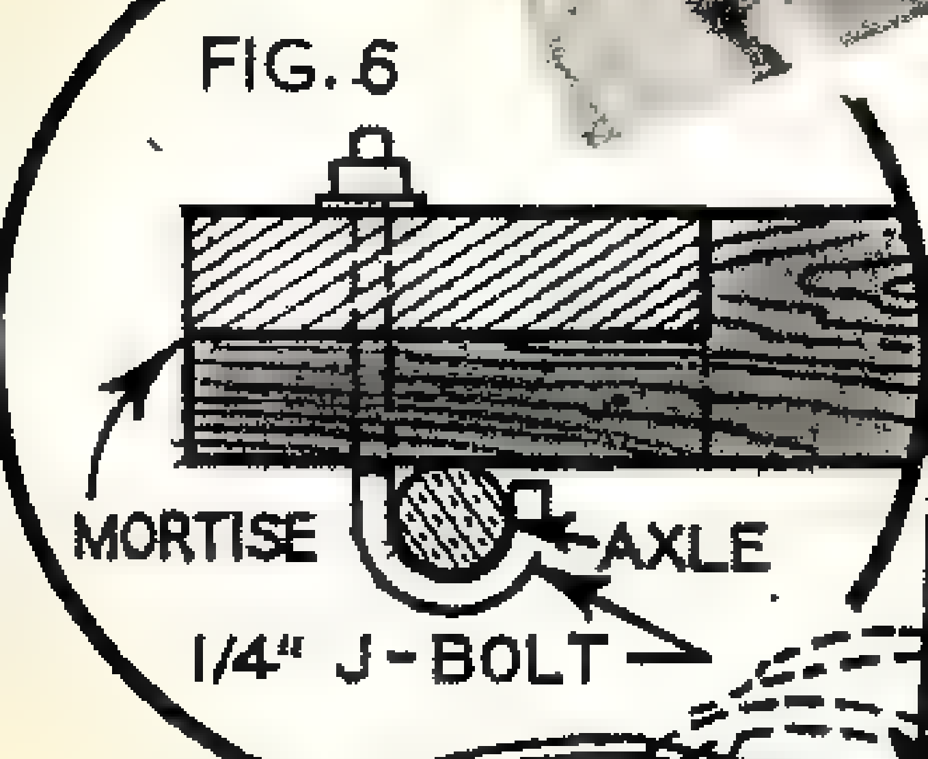
FIG. 1 SIDE VIEW

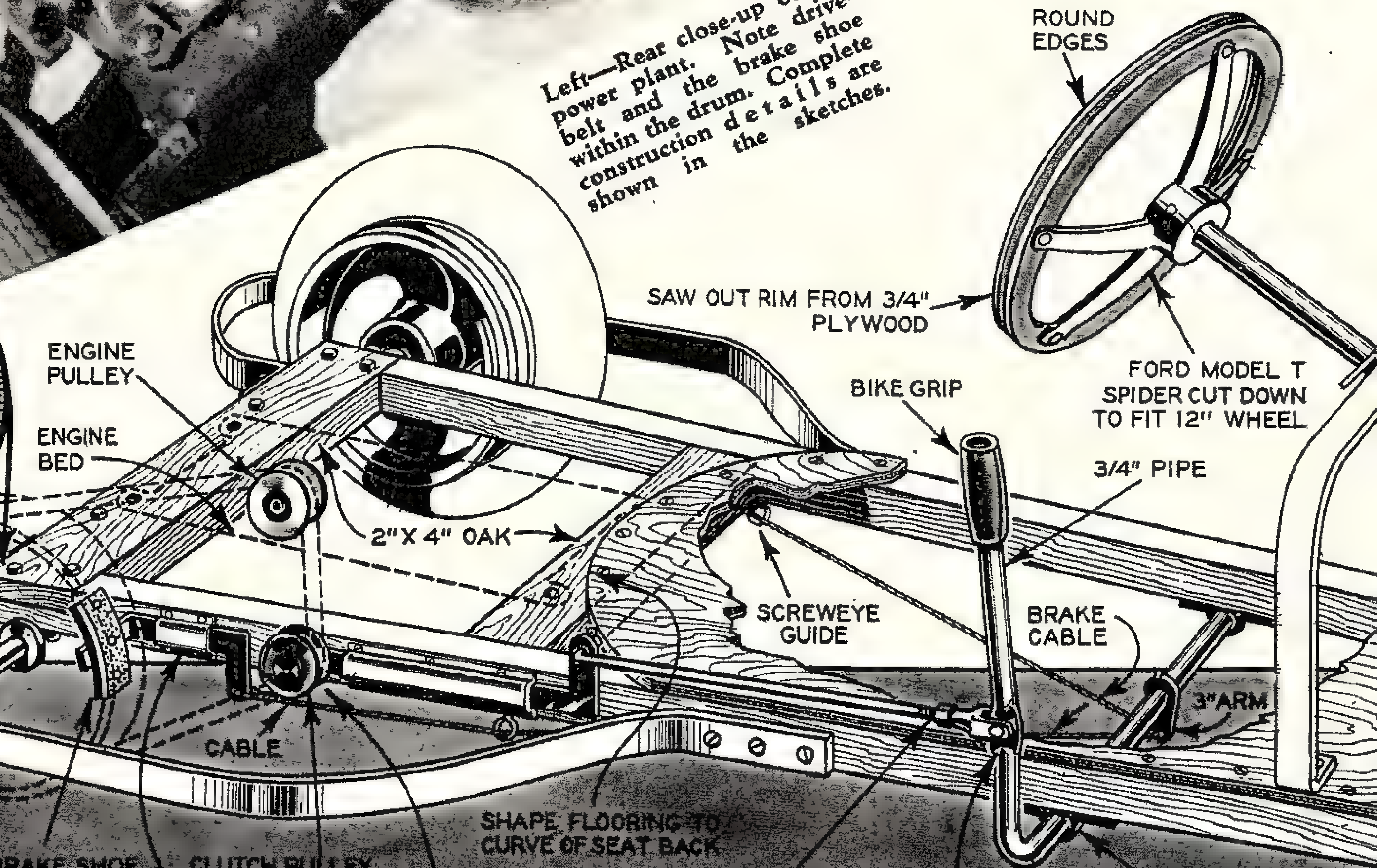

1/2 H.P. WASHING MACHINE MOTOR
8"
6"
6"
16"
64"
28"
9"
ORANGE
RED
VISOR
BUMPER



Left—Rear close-up of the power plant. Note drive-belt and the brake shoe within the drum. Complete construction details are shown in the sketches.

FIG. 6


MORTISE
AXLE
1/4" J-BOLT


ROUND EDGES
SAW OUT RIM FROM 3/4" PLYWOOD
FORD MODEL T SPIDER CUT DOWN TO FIT 12" WHEEL
BIKE GRIP
3/4" PIPE
ENGINE PULLEY
ENGINE BED
2" X 4" OAK
SCREWEYE GUIDE
BRAKE CABLE
3" ARM
CABLE
FENDER BAR OF SPRING STEEL
BRAKE SHOE
CLUTCH PULLEY
SHAPE FLOORING TO CURVE OF SEAT BACK
MODEL T BRAKE ROD AND YOKE
FLATTEN
STRAP IRON

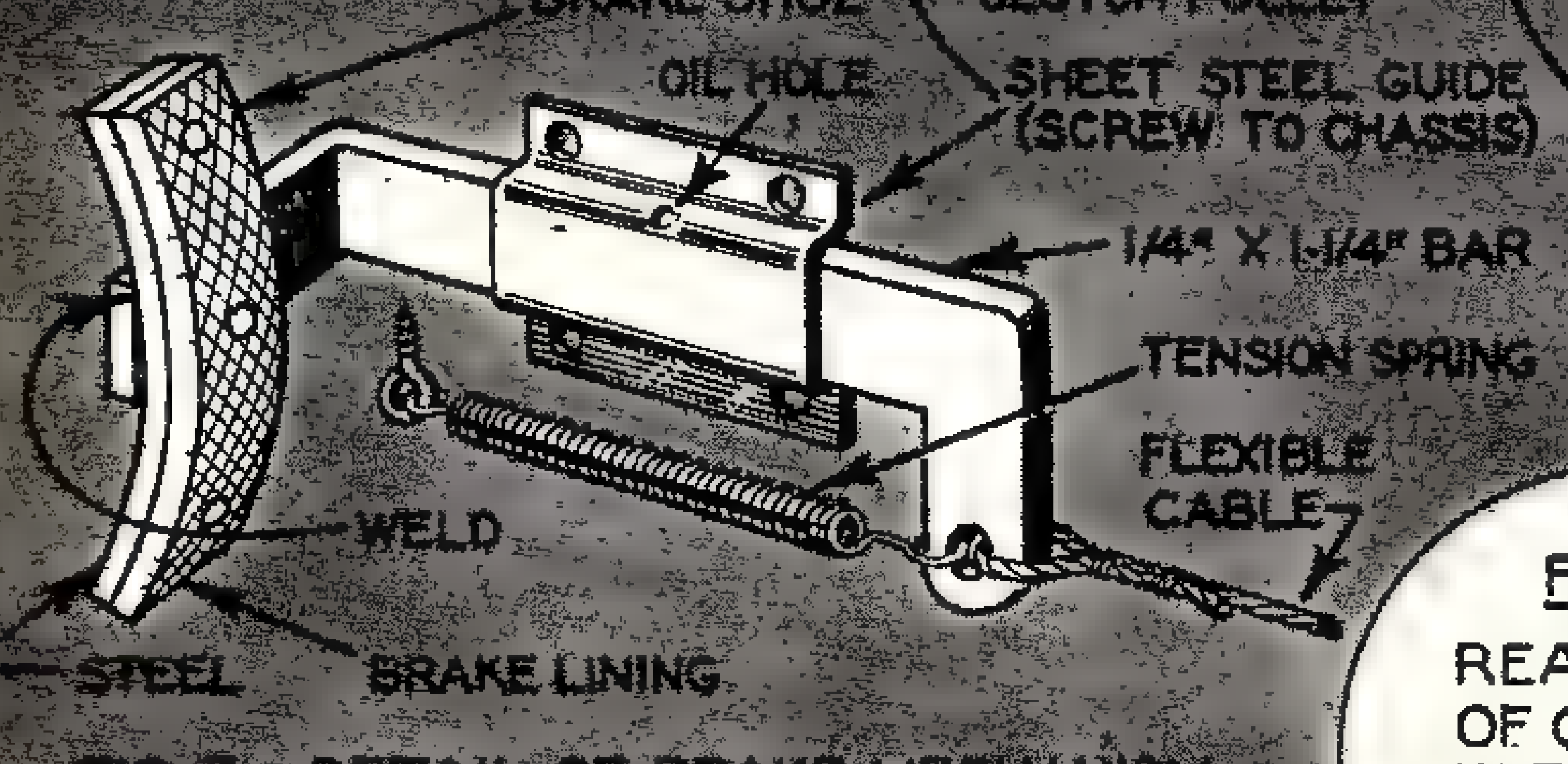

BRAKE SHOE
OIL HOLE
SHEET STEEL GUIDE (SCREW TO CHASSIS)
1/4" X 1-1/4" BAR
TENSION SPRING
FLEXIBLE CABLE
WELD
STEEL
BRAKE LINING

FIG. 7 - DETAIL OF BRAKE MECHANISM
2 COMPLETE ASSEMBLIES REQUIRED

FIG. 4
REAR END OF CHASSIS WITH DRIVE AND BRAKING DETAILS

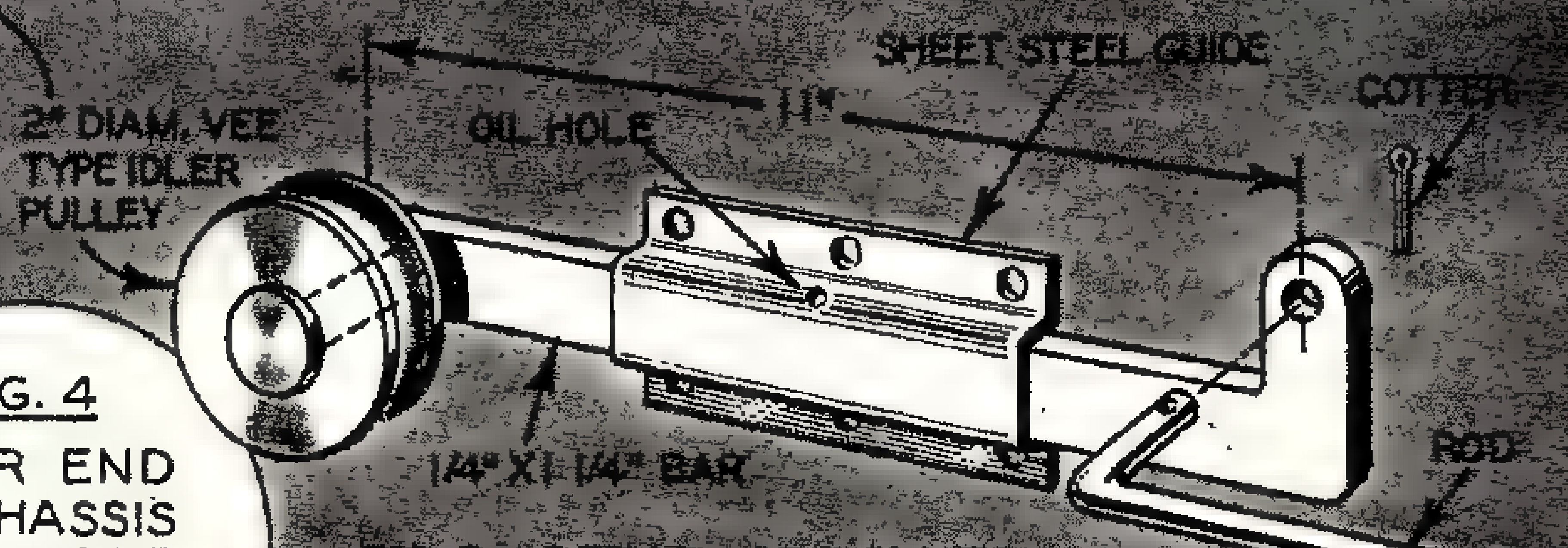

2" DIAM. VEE TYPE IDLER PULLEY
SHEET STEEL GUIDE
11"
OIL HOLE
COTTER
1/4" X 1-1/4" BAR
ROD

FIG. 8 - DETAIL OF "CLUTCH"

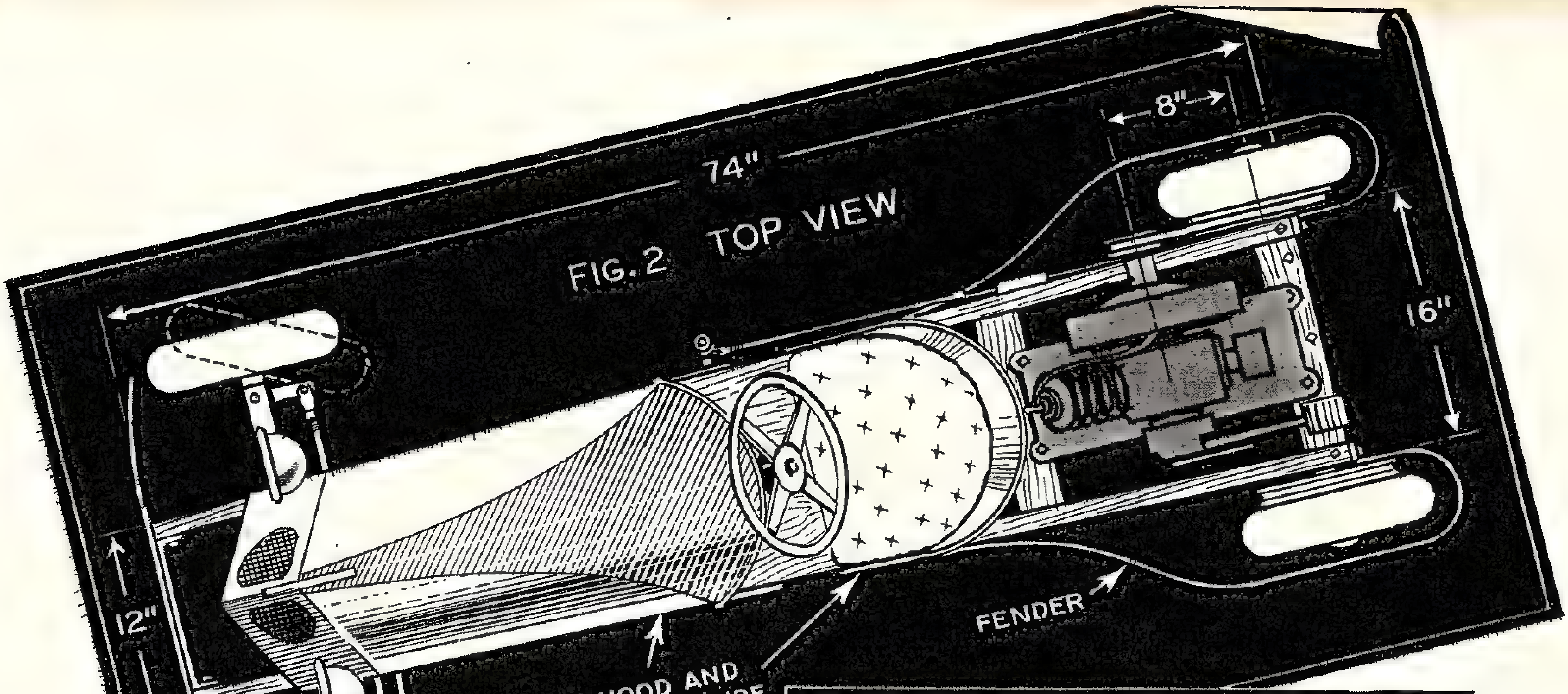


FIG. 2 TOP VIEW

74"
8"
16"
12"
SCREW HOOD AND SEAT EDGES TO SIDE MEMBERS OF FRAME
FENDER

the edges of the metal should be beaded. The edge of the seat back is protected with a strip of leather laced on with rawhide. It will be best to leave the cutting of the hood, etc., until the chassis is completed.

Several types of wheels are available for small autos, being manufactured by toy makers, tire companies, etc. The original car in the photos has disk wheels with the brake drum and pulley cast integral, and turned

[*Continued on page* 118]

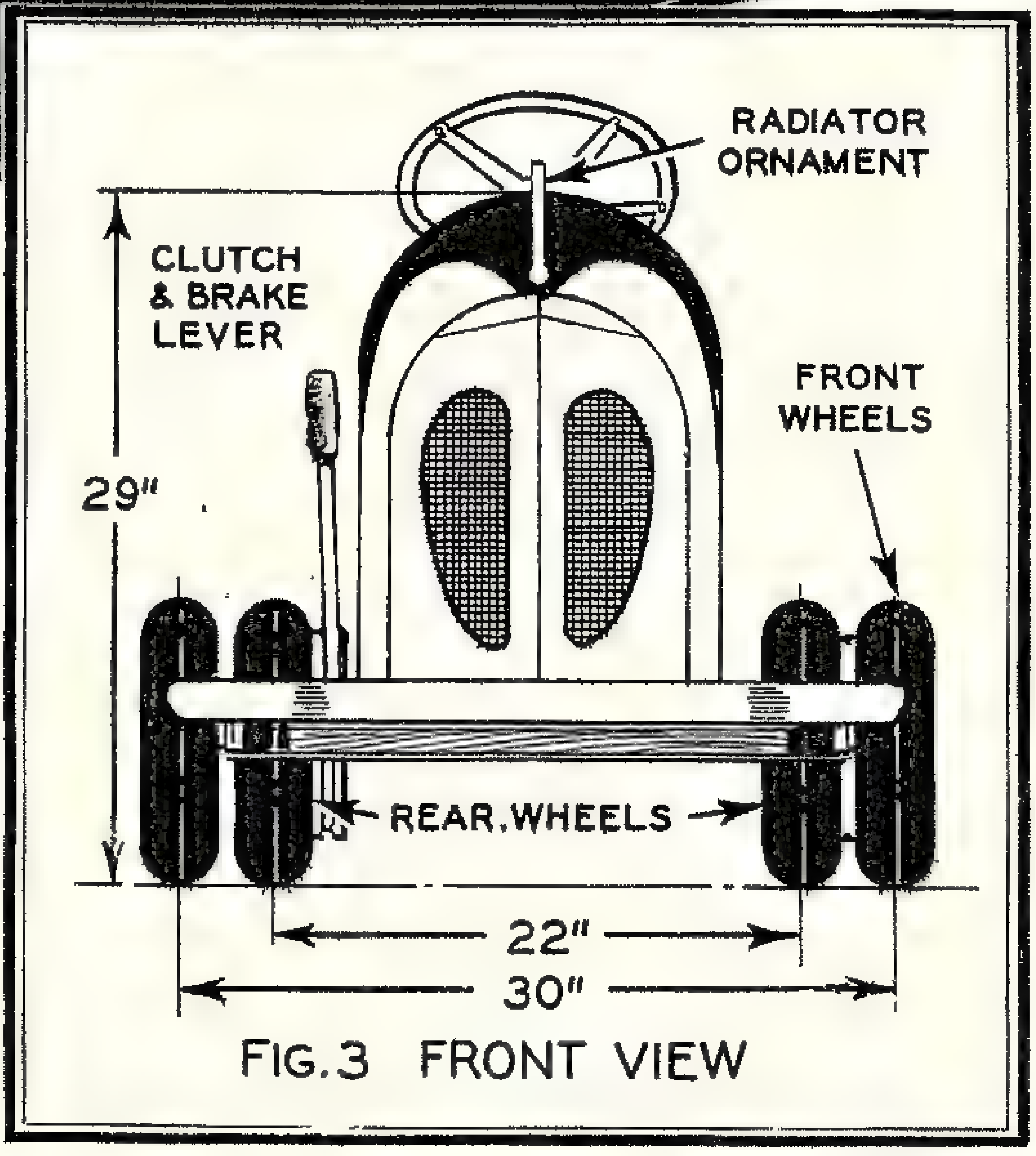


FIG. 3 FRONT VIEW

RADIATOR ORNAMENT
CLUTCH & BRAKE LEVER
FRONT WHEELS
29"
REAR WHEELS
22"
30"

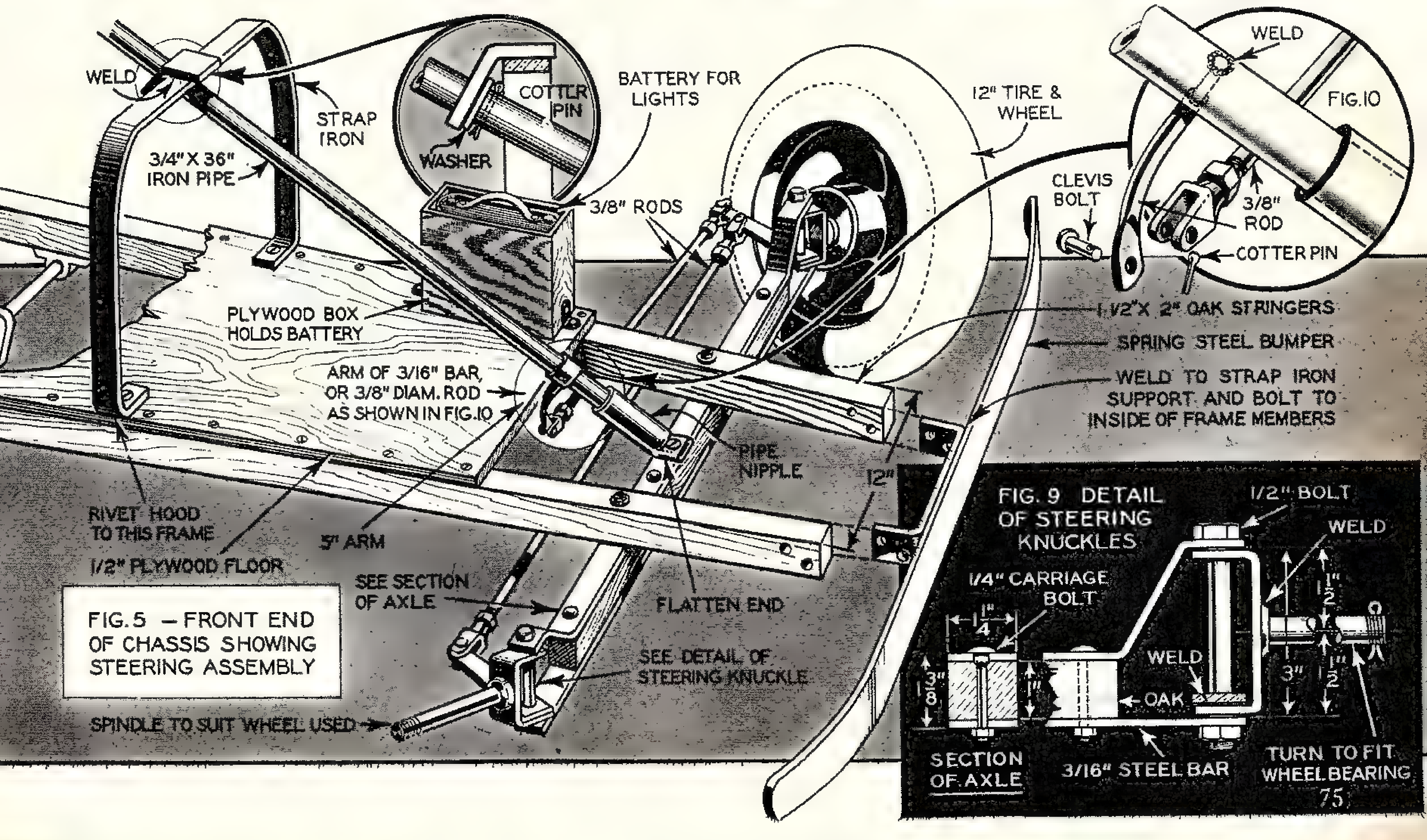


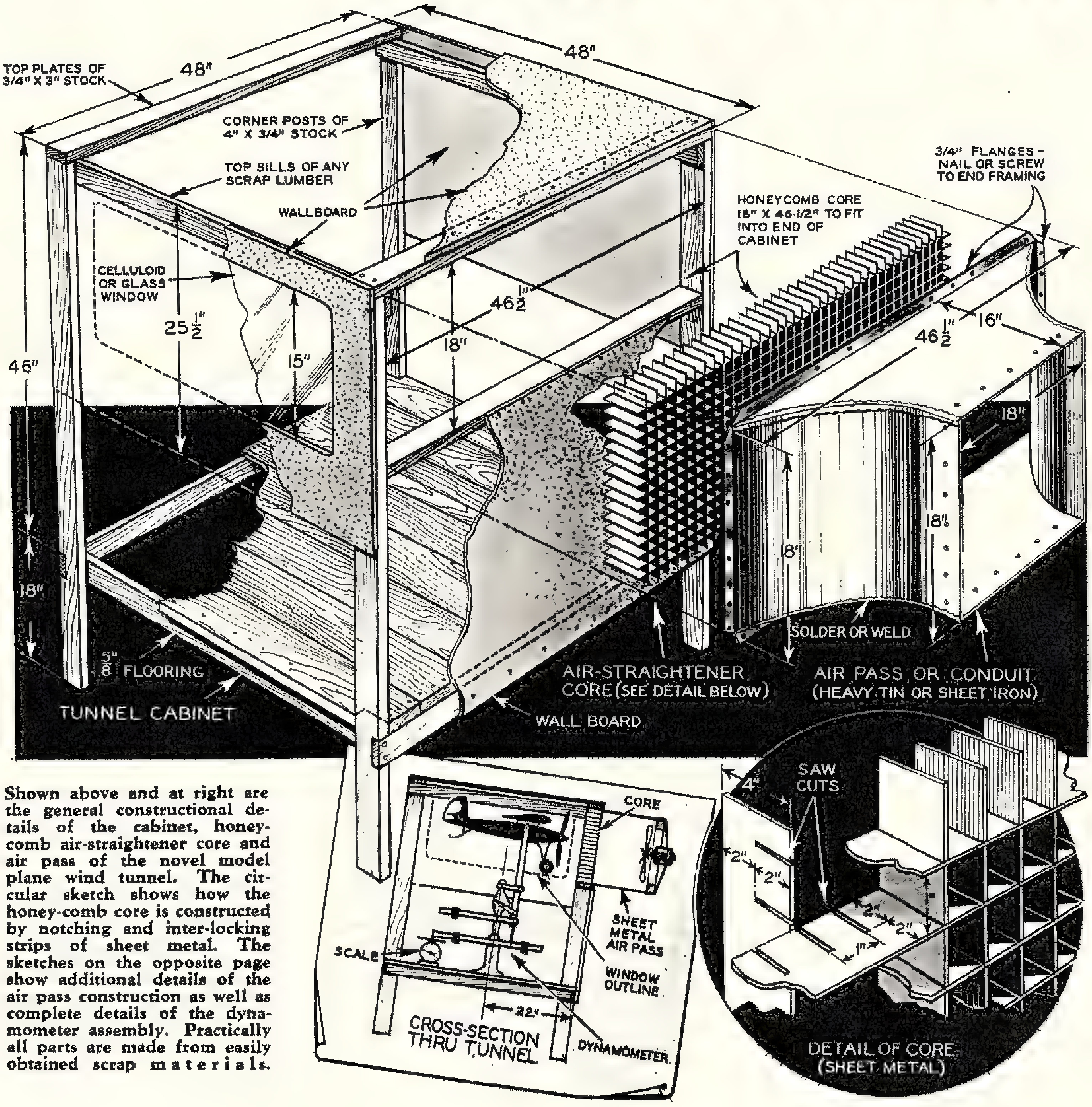
FIG. 5 — FRONT END OF CHASSIS SHOWING STEERING ASSEMBLY

FIG. 9 DETAIL OF STEERING KNUCKLES

FIG. 10

WELD
STRAP IRON
3/4" X 36" IRON PIPE
COTTER PIN
WASHER
BATTERY FOR LIGHTS
3/8" RODS
12" TIRE & WHEEL
CLEVIS BOLT
WELD
3/8" ROD
COTTER PIN
PLYWOOD BOX HOLDS BATTERY
ARM OF 3/16" BAR, OR 3/8" DIAM. ROD AS SHOWN IN FIG.10
1 1/2" X 2" OAK STRINGERS
SPRING STEEL BUMPER
WELD TO STRAP IRON SUPPORT AND BOLT TO INSIDE OF FRAME MEMBERS
PIPE NIPPLE
12"
RIVET HOOD TO THIS FRAME
1/2" PLYWOOD FLOOR
5" ARM
SEE SECTION OF AXLE
FLATTEN END
SEE DETAIL OF STEERING KNUCKLE
SPINDLE TO SUIT WHEEL USED
1/2" BOLT
WELD
1/4" CARRIAGE BOLT
1 1/4"
1 3/8"
1"
WELD
OAK
1 1/2"
3"
1 1/2"
SECTION OF AXLE
3/16" STEEL BAR
TURN TO FIT WHEEL BEARING

TEST YOUR MODEL in this WIND

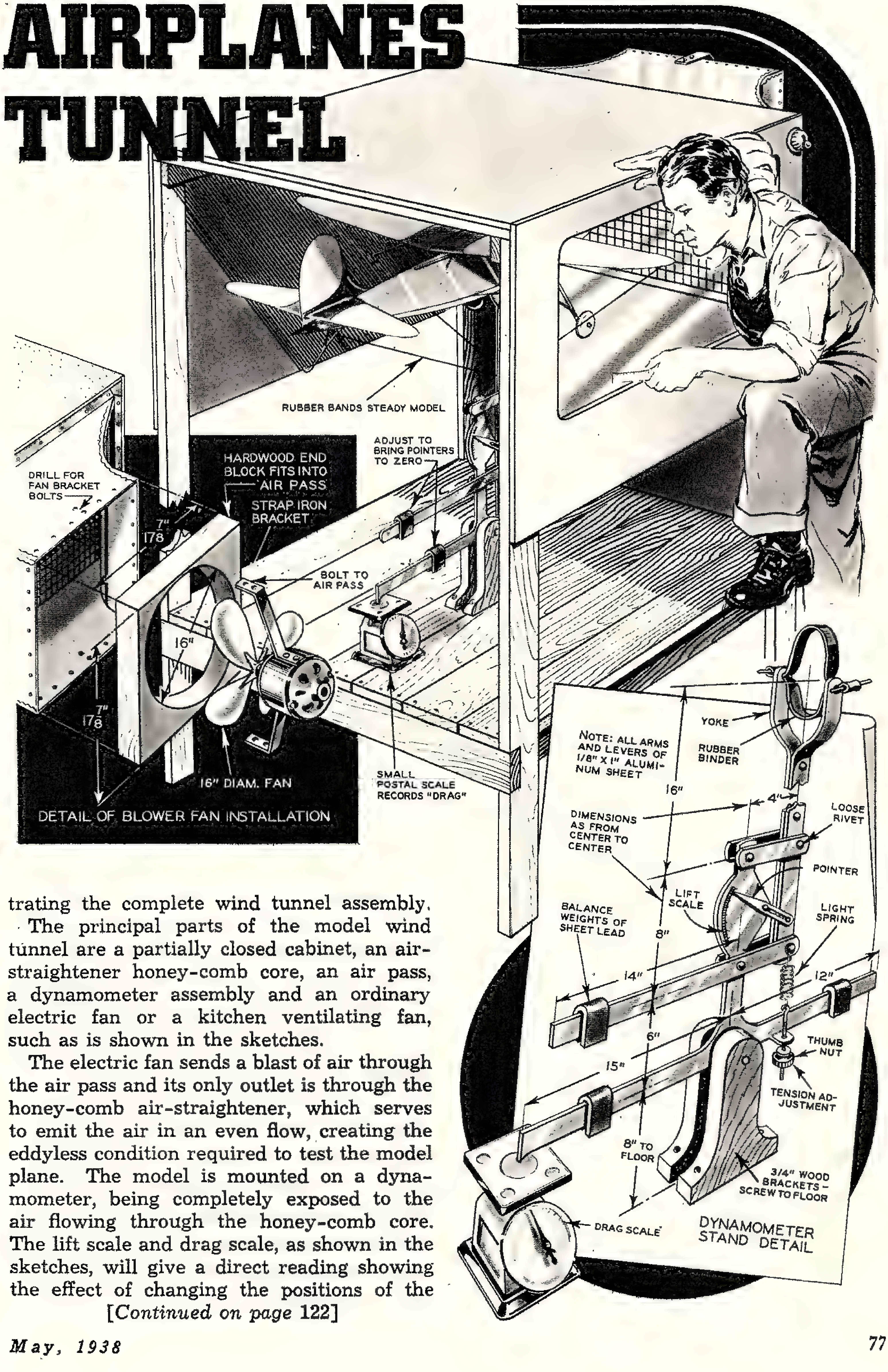

TOP PLATES OF 3/4" X 3" STOCK
48"
48"
CORNER POSTS OF 4" X 3/4" STOCK
TOP SILLS OF ANY SCRAP LUMBER
WALLBOARD
CELLULOID OR GLASS WINDOW
46"
25 1/2"
15"
18"
46 1/2"
18"
5/8" FLOORING
TUNNEL CABINET
HONEYCOMB CORE 18" X 46-1/2" TO FIT INTO END OF CABINET
3/4" FLANGES - NAIL OR SCREW TO END FRAMING
46 1/2"
16"
18"
18"
18"
SOLDER OR WELD
AIR-STRAIGHTENER CORE (SEE DETAIL BELOW)
AIR PASS OR CONDUIT (HEAVY TIN OR SHEET IRON)
WALL BOARD
CORE
SHEET METAL AIR PASS
WINDOW OUTLINE
SCALE
22"
CROSS-SECTION THRU TUNNEL
DYNAMOMETER
4"
SAW CUTS
2"
2"
2"
2"
1"
DETAIL OF CORE (SHEET METAL)

Shown above and at right are the general constructional details of the cabinet, honeycomb air-straightener core and air pass of the novel model plane wind tunnel. The circular sketch shows how the honey-comb core is constructed by notching and inter-locking strips of sheet metal. The sketches on the opposite page show additional details of the air pass construction as well as complete details of the dynamometer assembly. Practically all parts are made from easily obtained scrap materials.

IN RESPONSE to numerous requests received during the past few months, Modern Mechanix is herewith reprinting plans and details for the construction of a miniature wind tunnel for testing model airplanes. This article, in its original form, appeared in the MM "Flying Manual," 1932 edition, and was written by Dick Cole.

Many experimenters have undoubtedly tried to test their models in the blast of air from an electric fan, but such tests are highly unsatisfactory for the reason that the wind created by the fan is a mass of whirling currents—a miniature tornado. To test a model plane successfully, it must be placed in a flow of air that is moving with equal velocity throughout its entire cross-sectional area, and the air stream must be free of whirling eddies. How this ideal condition is brought about is shown in the sketch illus-

AIRPLANES TUNNEL


RUBBER BANDS STEADY MODEL
ADJUST TO BRING POINTERS TO ZERO
HARDWOOD END BLOCK FITS INTO AIR PASS
STRAP IRON BRACKET
DRILL FOR FAN BRACKET BOLTS
17⅞"
17⅞"
16"
BOLT TO AIR PASS
16" DIAM. FAN
SMALL POSTAL SCALE RECORDS "DRAG"
DETAIL OF BLOWER FAN INSTALLATION
NOTE: ALL ARMS AND LEVERS OF 1/8" X 1" ALUMINUM SHEET
YOKE
RUBBER BINDER
16"
4"
LOOSE RIVET
DIMENSIONS AS FROM CENTER TO CENTER
POINTER
LIFT SCALE
LIGHT SPRING
BALANCE WEIGHTS OF SHEET LEAD
8"
14"
12"
6"
THUMB NUT
15"
TENSION ADJUSTMENT
8" TO FLOOR
3/4" WOOD BRACKETS - SCREW TO FLOOR
DRAG SCALE
DYNAMOMETER STAND DETAIL

trating the complete wind tunnel assembly.

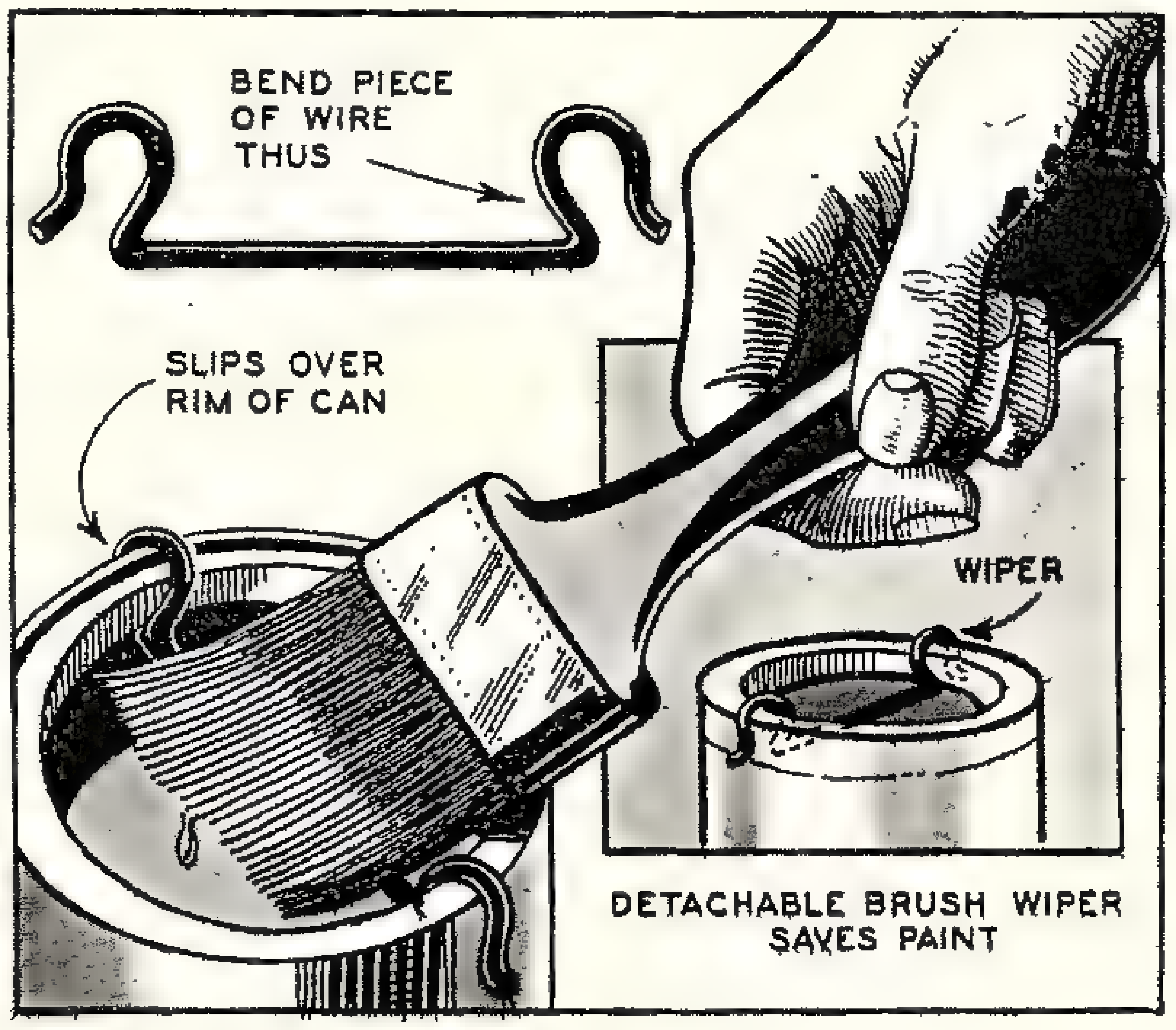
The principal parts of the model wind tunnel are a partially closed cabinet, an air-straightener honey-comb core, an air pass, a dynamometer assembly and an ordinary electric fan or a kitchen ventilating fan, such as is shown in the sketches.

The electric fan sends a blast of air through the air pass and its only outlet is through the honey-comb air-straightener, which serves to emit the air in an even flow, creating the eddyless condition required to test the model plane. The model is mounted on a dynamometer, being completely exposed to the air flowing through the honey-comb core. The lift scale and drag scale, as shown in the sketches, will give a direct reading showing the effect of changing the positions of the

[*Continued on page* 122]

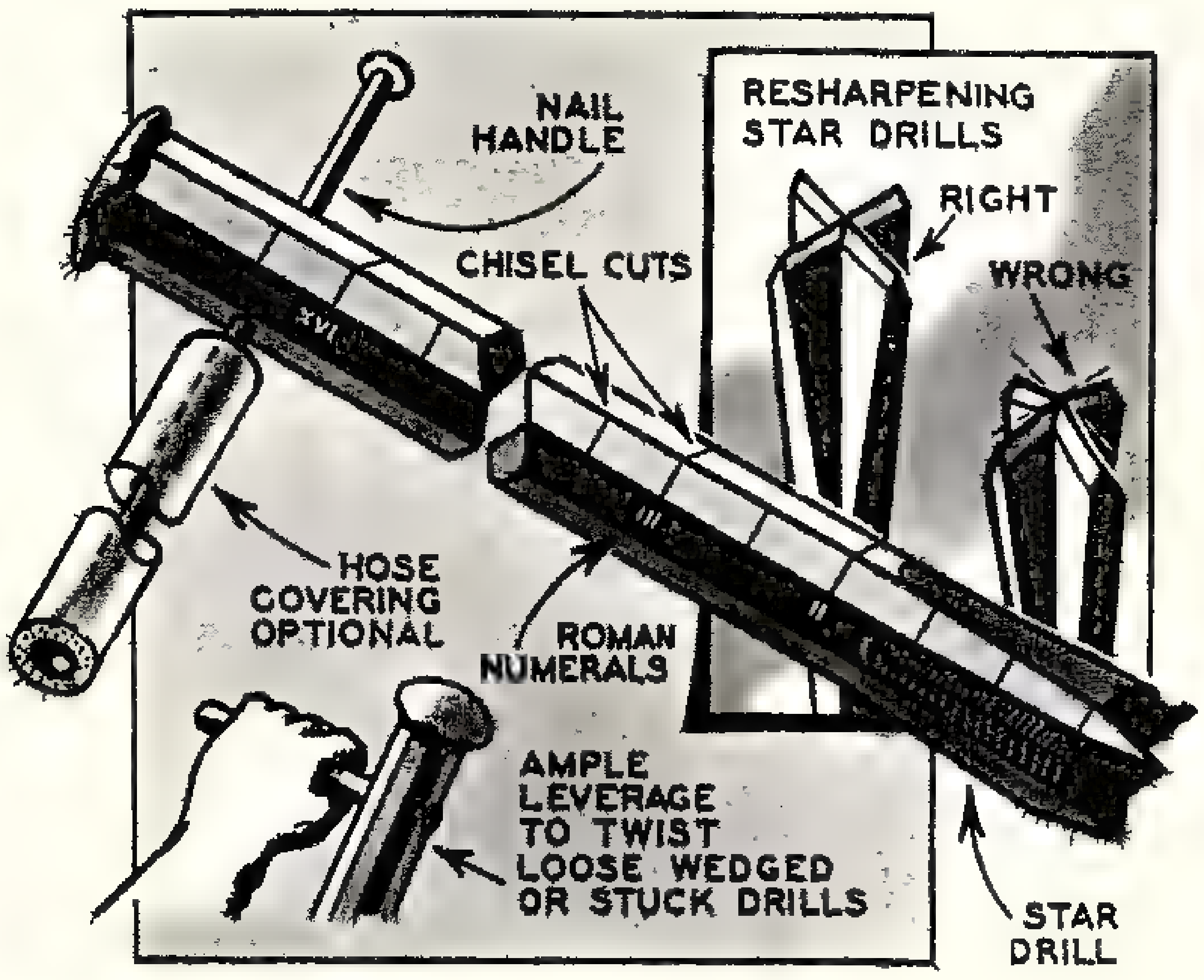
Handy Wire Brush Wringer Fits Any Paint Can

A PIECE of spring wire bent to the shape shown in the drawing makes an efficient paint brush wringer. Instead of the usual method of drawing the brush full of paint across the edge of the can and having some of it run down the side, the wire across the center of the can makes it possible to pull the brush over it and have all the excess paint drip back into the can. When the wire is to be used on another can, wipe it off thoroughly and it is ready for use with a different color. When preparing the wire, bend it so that when it is fastened in place, the ends spring closed against the rim.—A. H.


BEND PIECE OF WIRE THUS
SLIPS OVER RIM OF CAN
WIPER

DETACHABLE BRUSH WIPER SAVES PAINT

Handy Kinks For Star Drills


NAIL HANDLE
CHISEL CUTS
RESHARPENING STAR DRILLS
RIGHT
WRONG
HOSE COVERING OPTIONAL
ROMAN NUMERALS
AMPLE LEVERAGE TO TWIST LOOSE WEDGED OR STUCK DRILLS
STAR DRILL

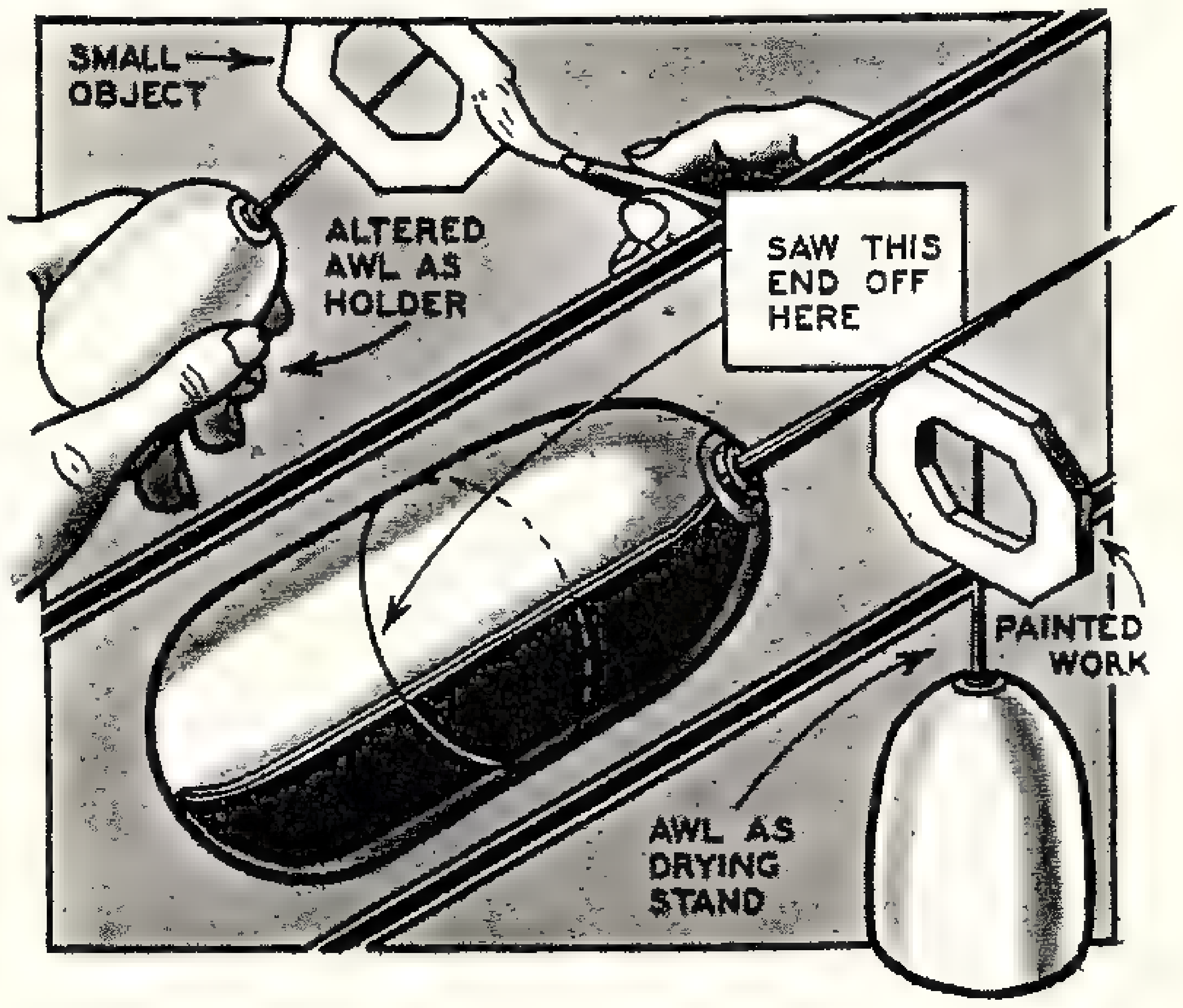
IF THE shank of a star drill is marked off in inch and half-inch notches, it will always indicate its depth in the hole it is making, eliminating the necessity for measuring drilling progress with a ruler. Either Roman numerals or just scratches can be used to indicate depth. When taking readings, allow for shortening of the drill by sharpening.

A drill often becomes wedged tight unless constantly rotated and the hole cleared frequently. When it does become wedged, sometimes it is necessary to use a wrench to loosen it. If a hole is drilled through the upper part of the shank and a large nail or bolt inserted, this "handle" facilitates the turning of the tool and its removal from the hole when it is necessary to clear it of dust and chips.

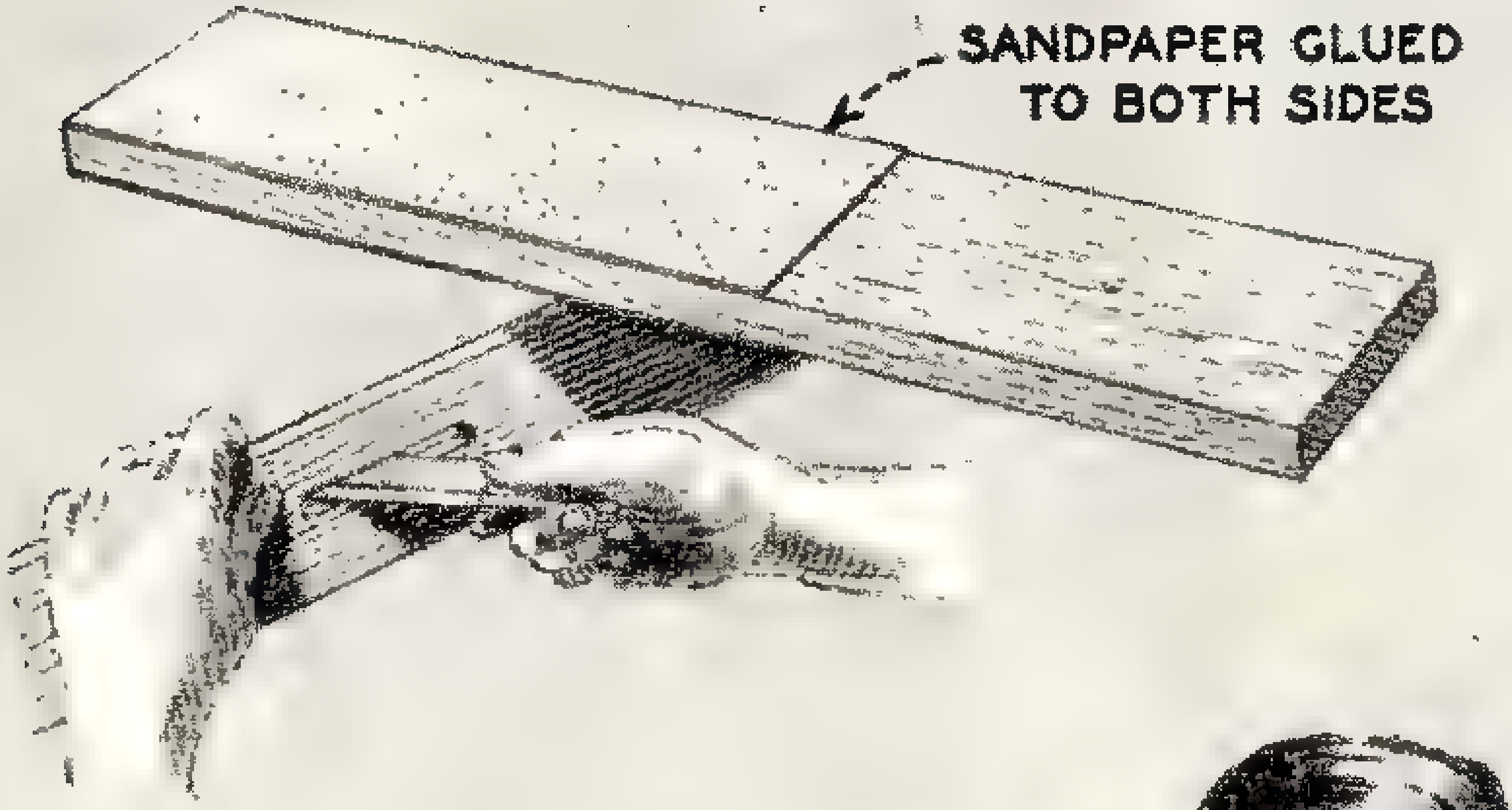
When sharpening star drill, grind the edges so that they do not taper up to the point, as shown in the drawing.—Andrew Vena.

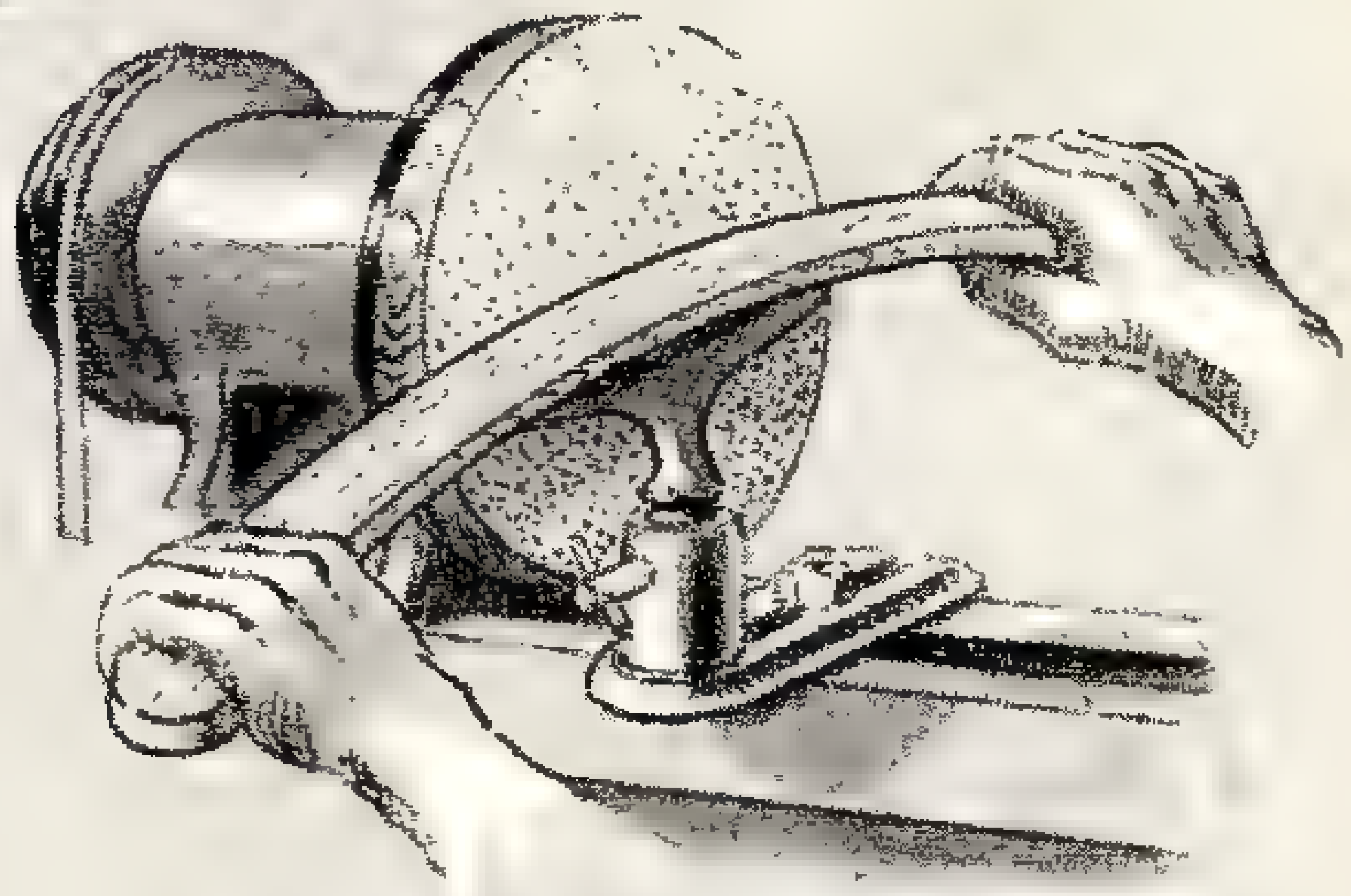
Awl Aids Difficult Painting

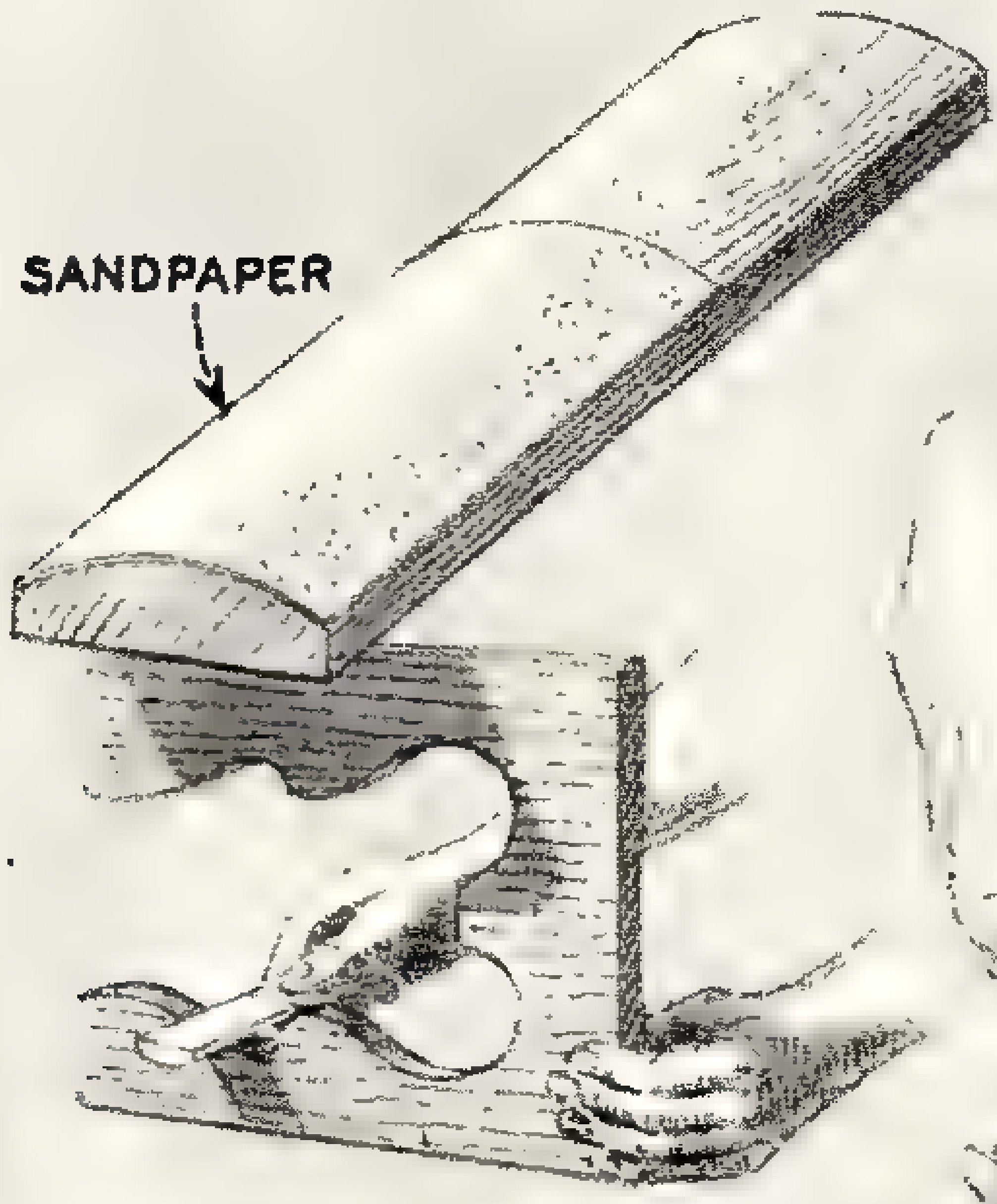
AN ORDINARY awl with one end cut off as shown in the drawing, is an invaluable aid while painting small objects such as handles, knobs, etc., when there is nothing on the object which will serve as a handle as the painting is being done. The point of the awl is pushed into the object until it supports it firmly. The awl with the object attached can be held in the hand firmly while the painting is being done. The end of the awl should have been sawed off flat so that it will stand up by itself while the paint is drying. If an awl is not available, a large nail can be sharpened so that it will duplicate the end of the awl. This pointed nail then can be forced through a block of wood and it will be as self-supporting as the awl.—G. B. Harran.

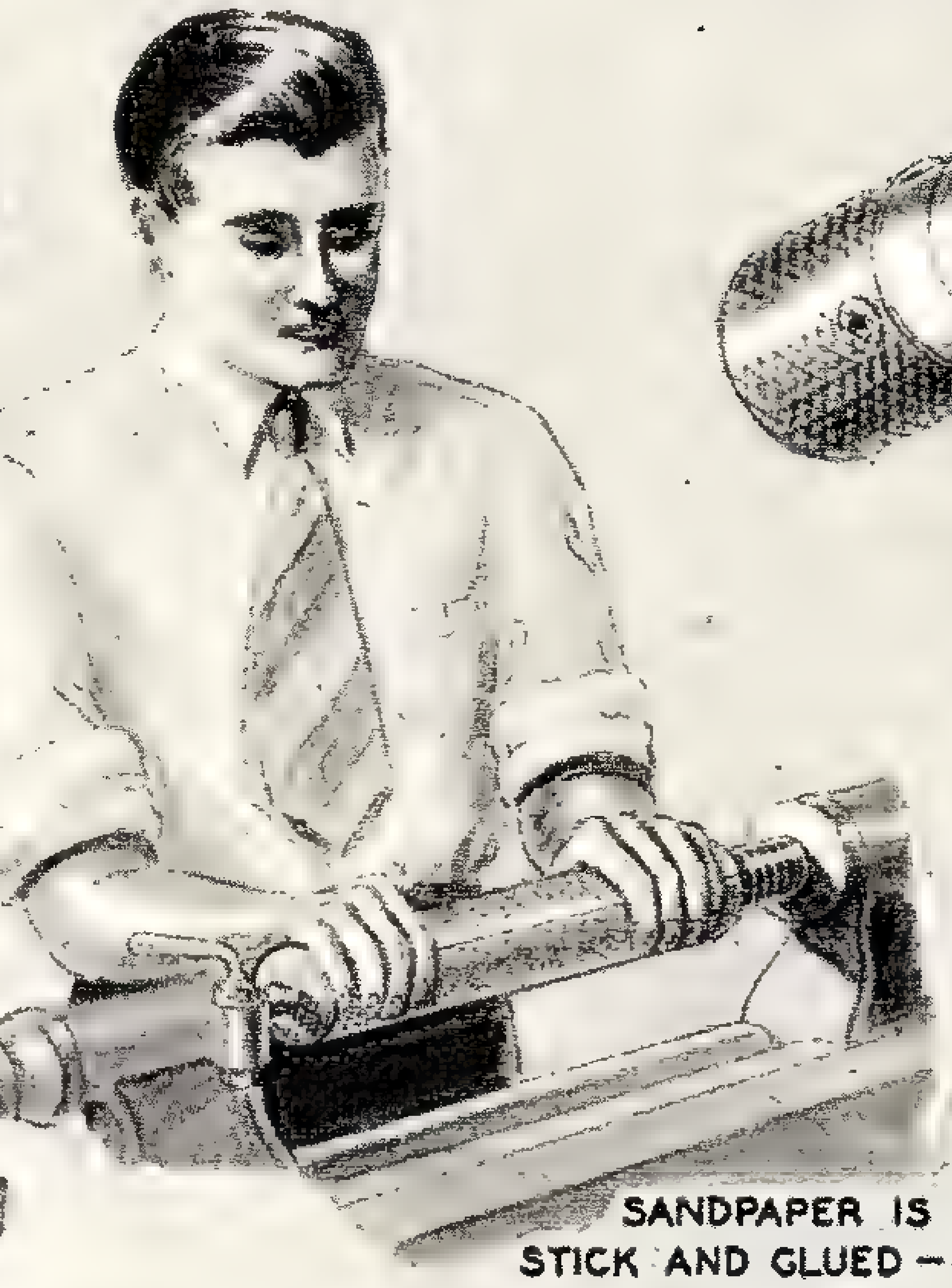

SMALL OBJECT
ALTERED AWL AS HOLDER
SAW THIS END OFF HERE
PAINTED WORK
AWL AS DRYING STAND

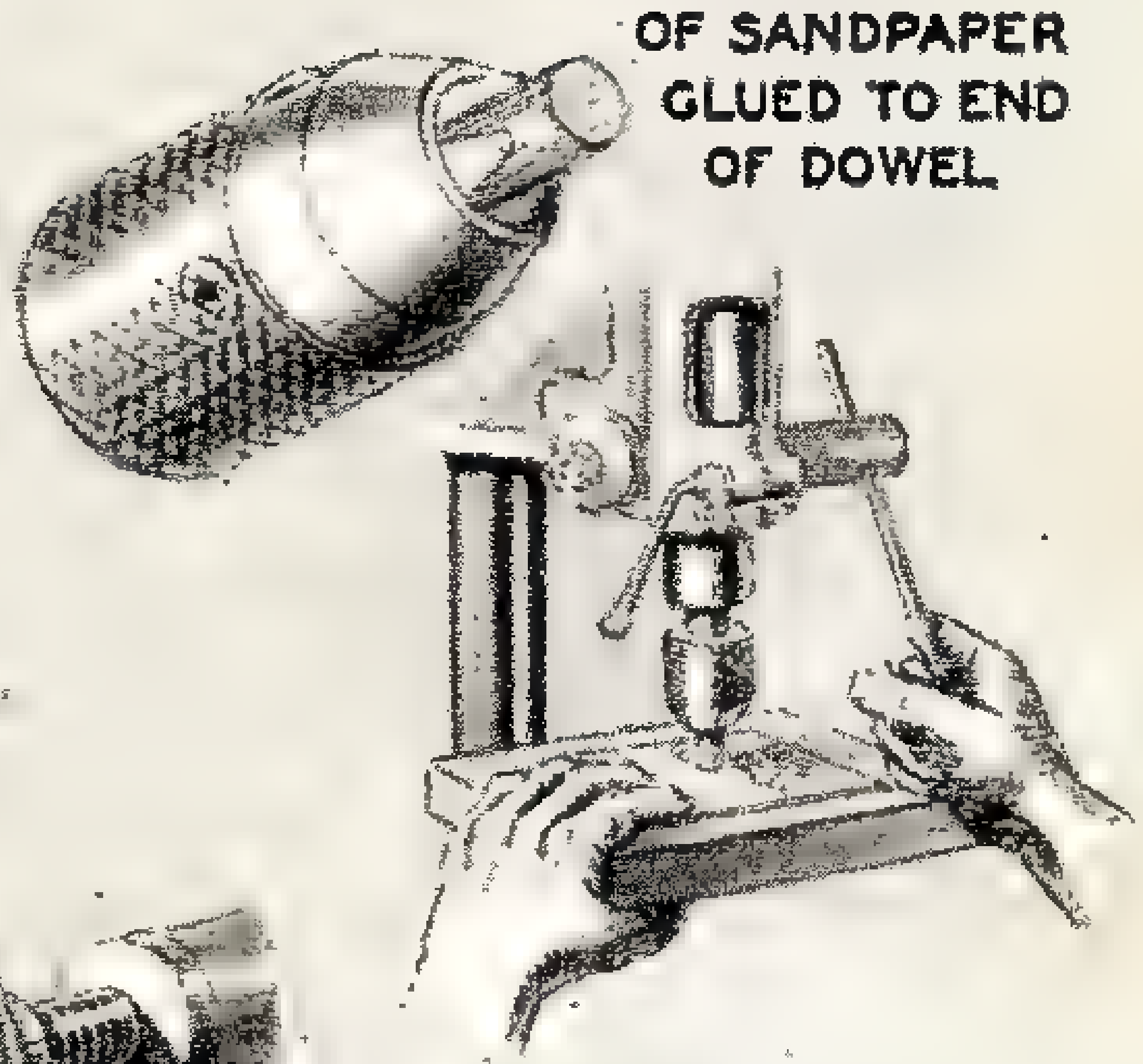
HANDY SANDPAPER FILES

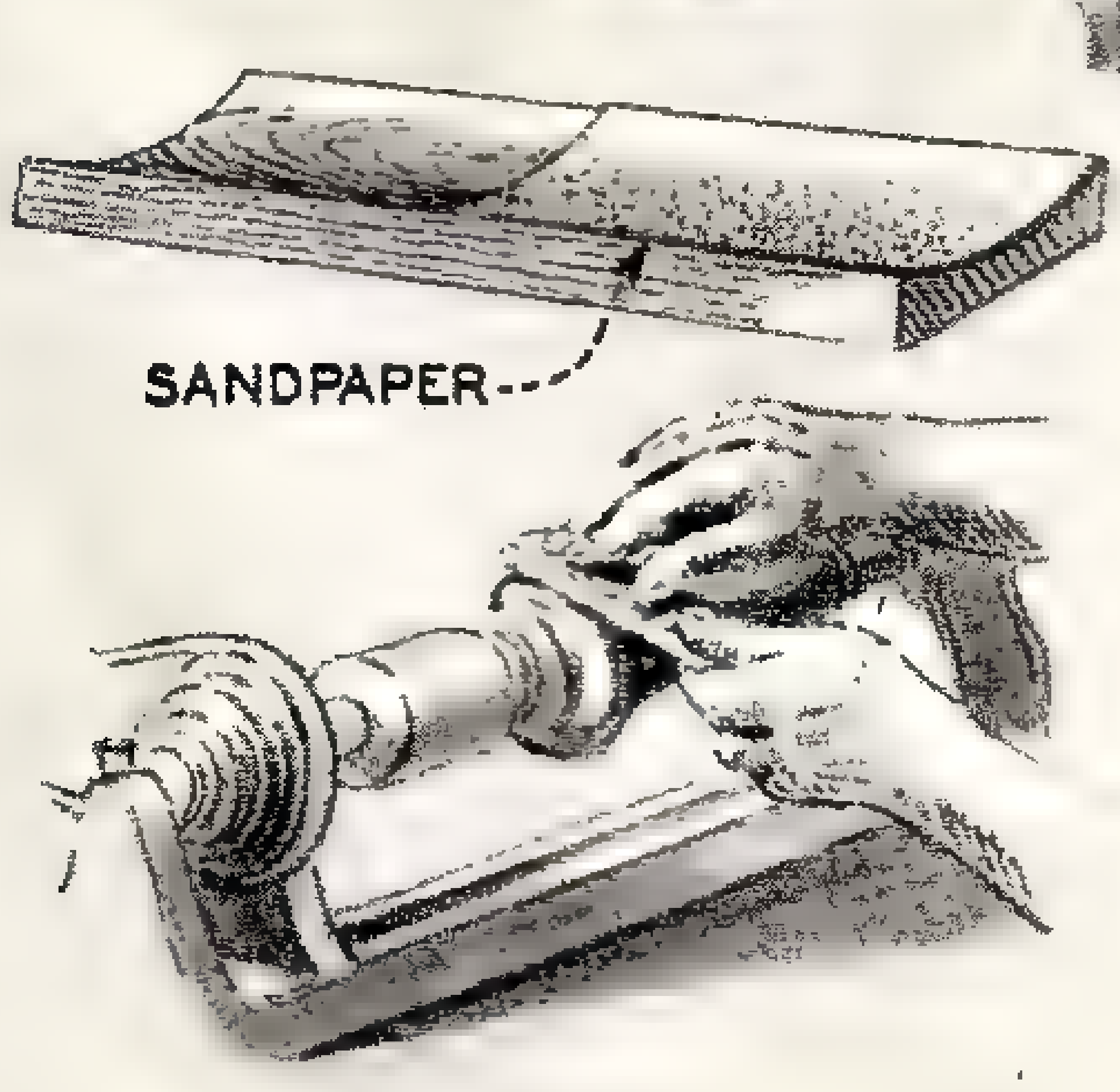

SANDPAPER GLUED TO BOTH SIDES

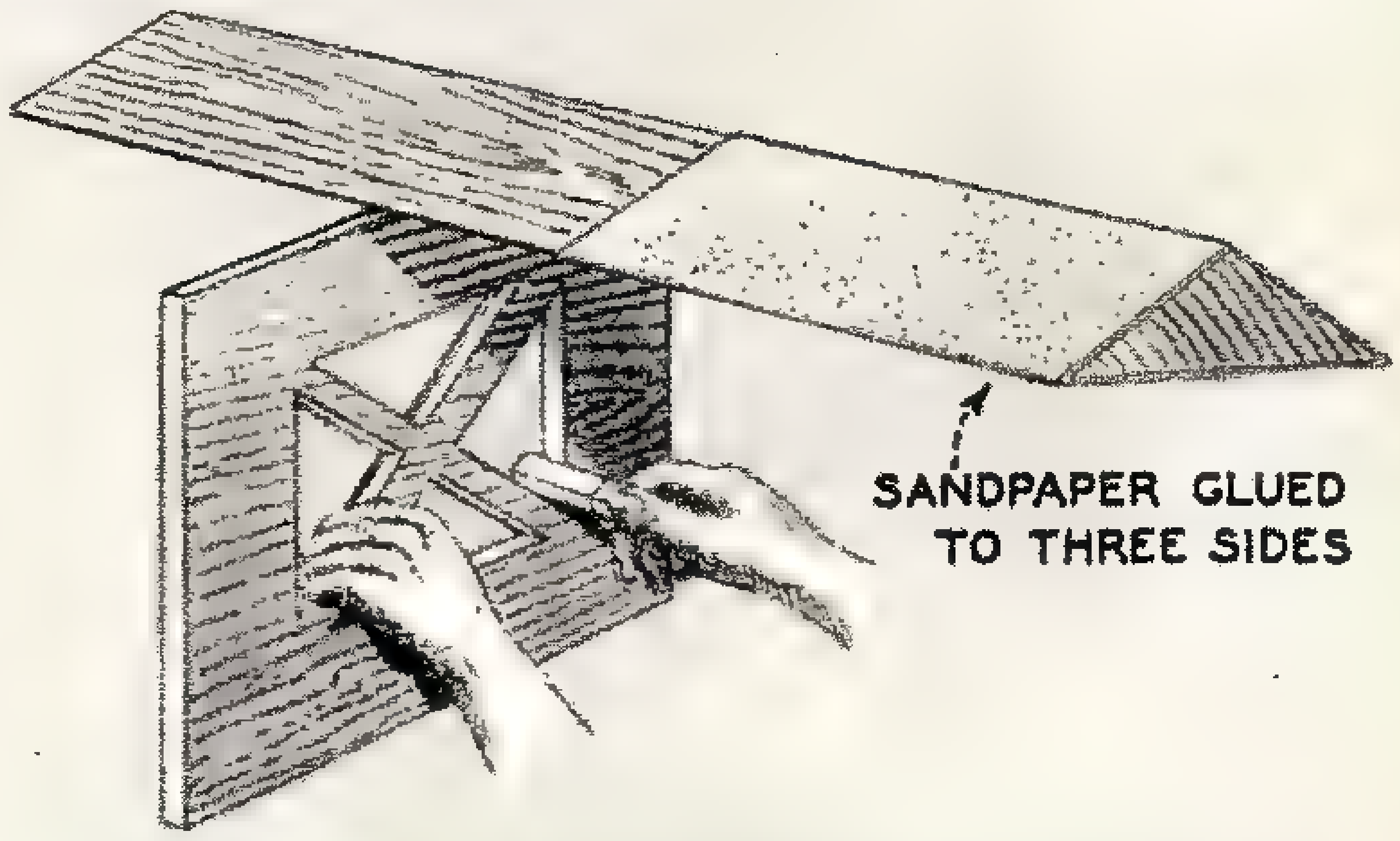

SANDPAPER GLUED TO WOODEN DISK AND FASTENED TO FACE PLATE

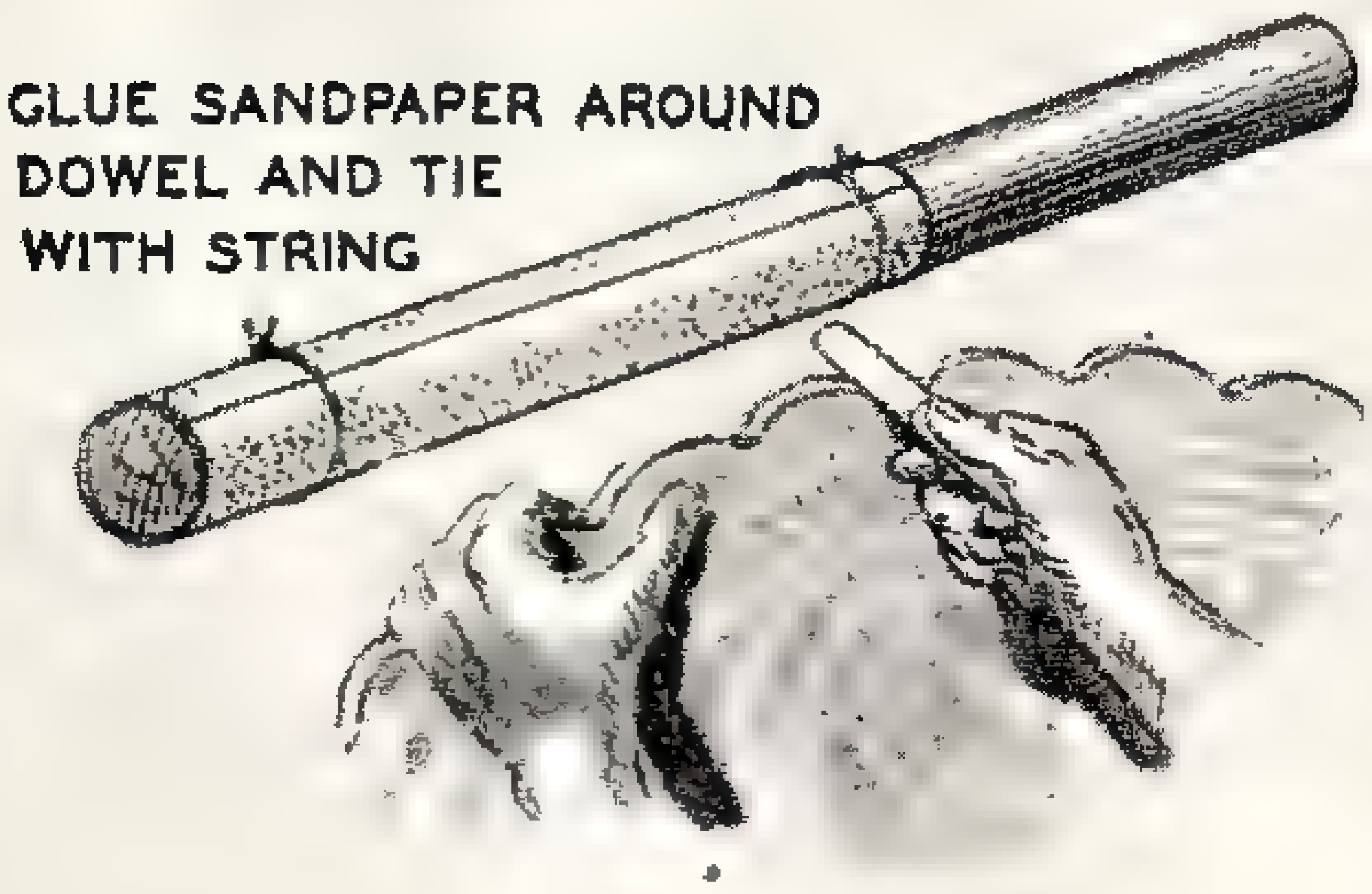



SANDPAPER IS WRAPPED AROUND STICK AND GLUED — HOLD IT IN PLACE WITH STRING UNTIL DRY


CIRCULAR PIECE OF SANDPAPER GLUED TO END OF DOWEL
DECORATIONS APPLIED TO METAL



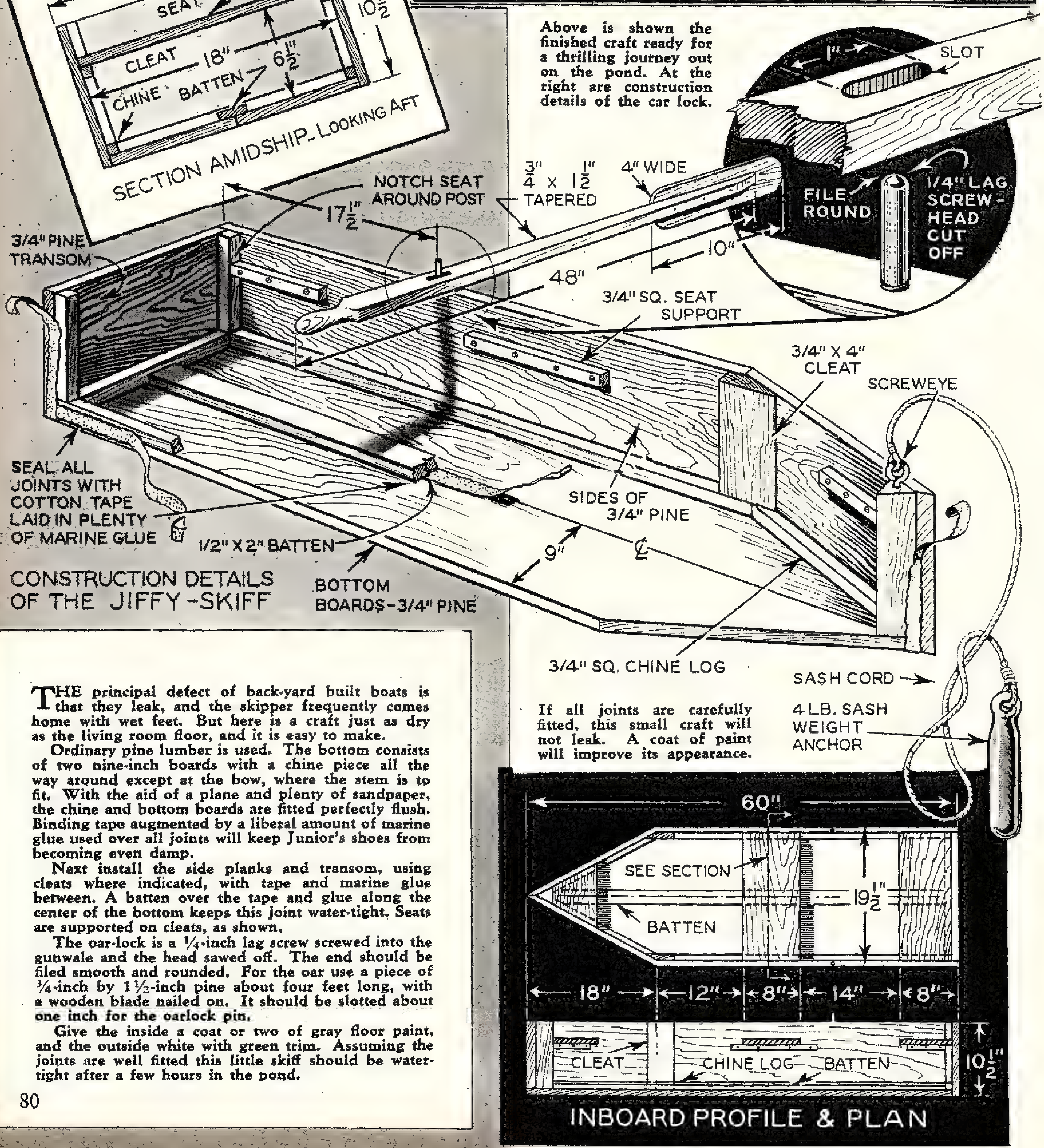

SANDPAPER GLUED TO THREE SIDES


GLUE SANDPAPER AROUND DOWEL AND TIE WITH STRING

The usefulness of sandpaper can be multiplied many times by fastening it to various-shaped strips of wood. Be sure to use a good grade of glue. Several sizes of each design will be found very helpful to the amateur craftsman.

Build a JIFFY-SKIFF

Above is shown the finished craft ready for a thrilling journey out on the pond. At the right are construction details of the car lock.


19½"
SEAT
CLEAT
18"
6½"
10½"
CHINE
BATTEN
SECTION AMIDSHIP_LOOKING AFT
NOTCH SEAT AROUND POST
17½"
¾" x 1½" TAPERED
4" WIDE
10"
48"
1"
SLOT
FILE ROUND
1/4" LAG SCREW-HEAD CUT OFF
3/4" PINE TRANSOM
3/4" SQ. SEAT SUPPORT
3/4" X 4" CLEAT
SCREWEYE
SEAL ALL JOINTS WITH COTTON TAPE LAID IN PLENTY OF MARINE GLUE
SIDES OF 3/4" PINE
1/2" X 2" BATTEN
9"
℄
BOTTOM BOARDS-3/4" PINE
3/4" SQ. CHINE LOG
SASH CORD
4 LB. SASH WEIGHT ANCHOR
60"
SEE SECTION
BATTEN
19½"
18"
12"
8"
14"
8"
CLEAT
CHINE LOG
BATTEN
10½"

CONSTRUCTION DETAILS OF THE JIFFY-SKIFF

INBOARD PROFILE & PLAN

THE principal defect of back-yard built boats is that they leak, and the skipper frequently comes home with wet feet. But here is a craft just as dry as the living room floor, and it is easy to make.

Ordinary pine lumber is used. The bottom consists of two nine-inch boards with a chine piece all the way around except at the bow, where the stem is to fit. With the aid of a plane and plenty of sandpaper, the chine and bottom boards are fitted perfectly flush. Binding tape augmented by a liberal amount of marine glue used over all joints will keep Junior's shoes from becoming even damp.

Next install the side planks and transom, using cleats where indicated, with tape and marine glue between. A batten over the tape and glue along the center of the bottom keeps this joint water-tight. Seats are supported on cleats, as shown.

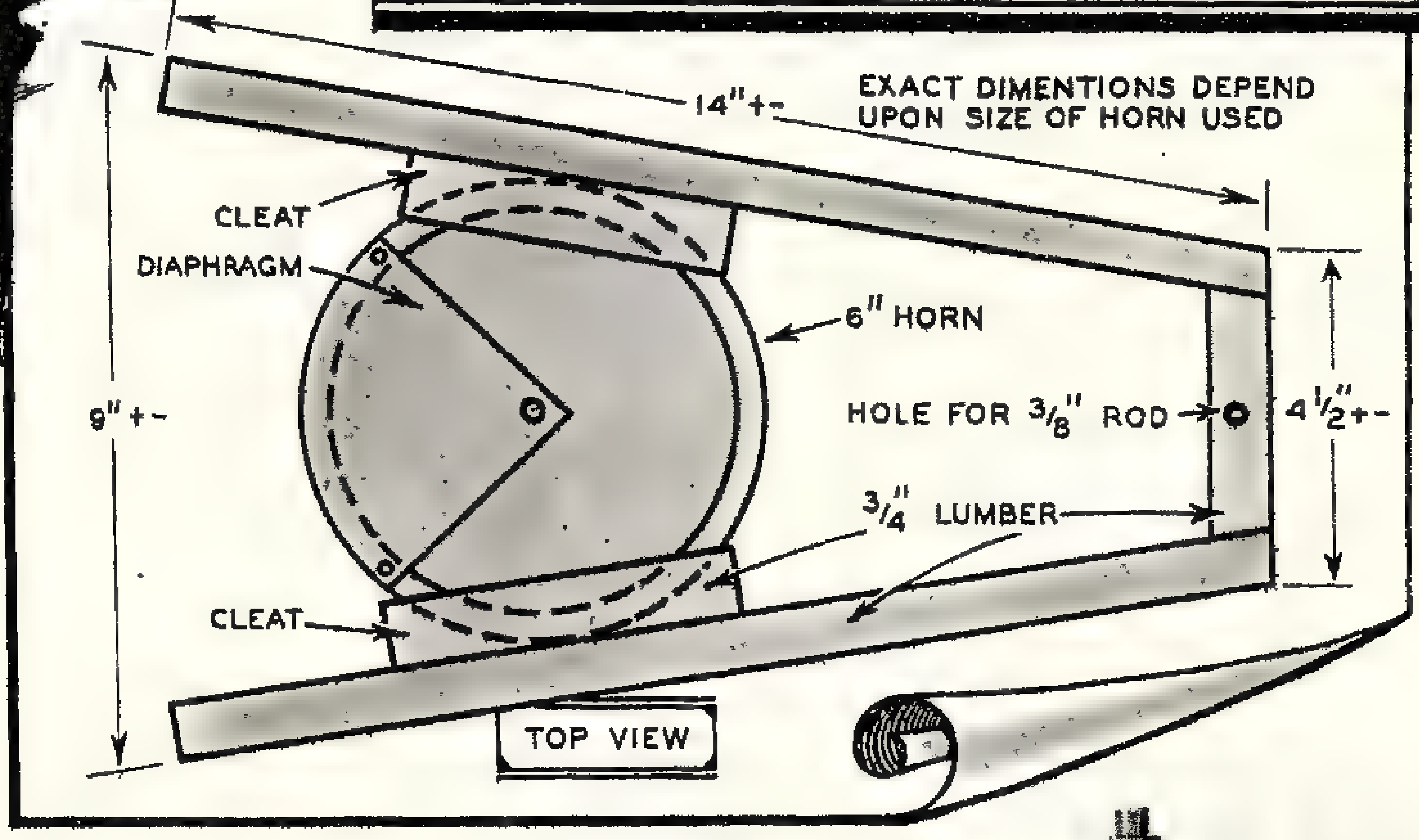
The oar-lock is a ¼-inch lag screw screwed into the gunwale and the head sawed off. The end should be filed smooth and rounded. For the oar use a piece of ¾-inch by 1½-inch pine about four feet long, with a wooden blade nailed on. It should be slotted about one inch for the oarlock pin.

Give the inside a coat or two of gray floor paint, and the outside white with green trim. Assuming the joints are well fitted this little skiff should be water-tight after a few hours in the pond.

If all joints are carefully fitted, this small craft will not leak. A coat of paint will improve its appearance.

A MODEL AIRPLANE JIG SAW

by Marwood Gardner

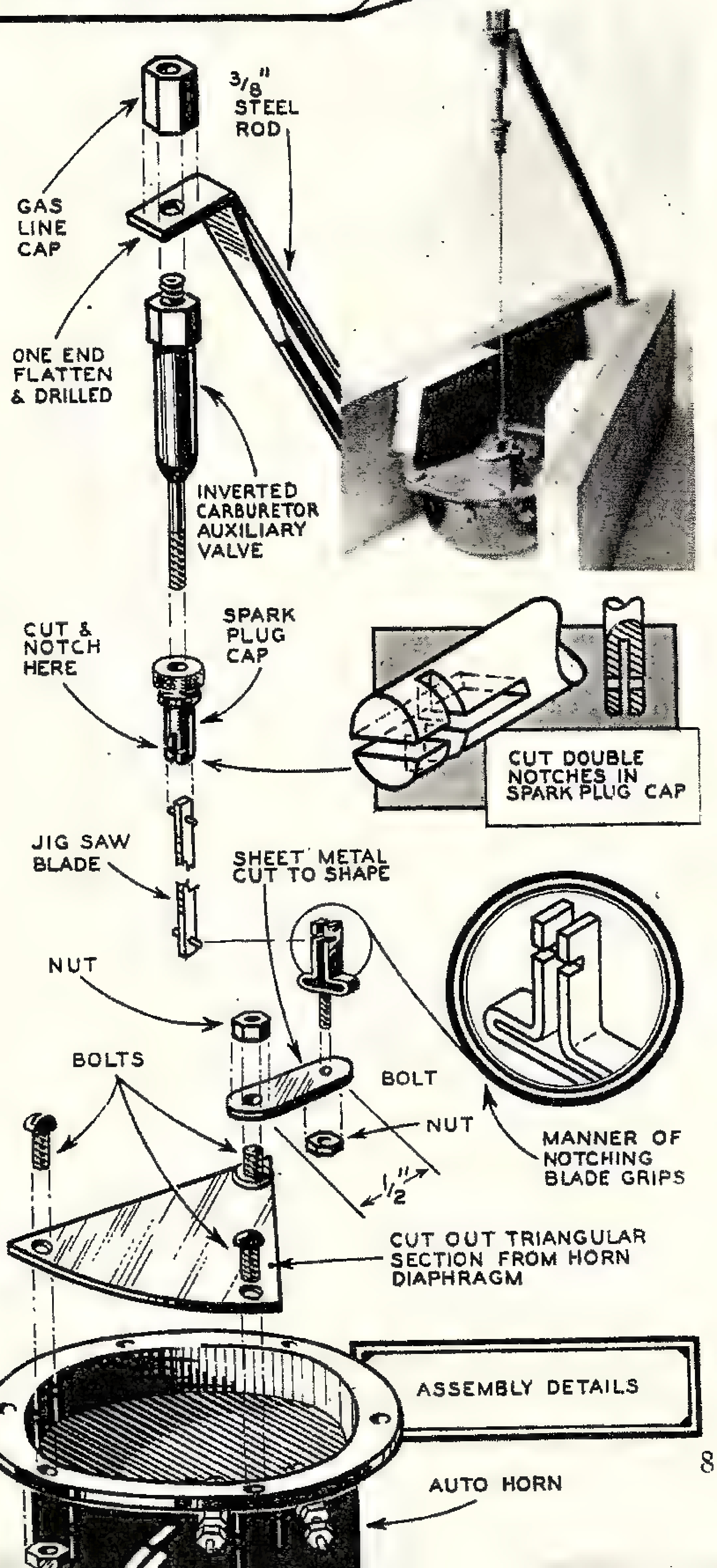

14"+-
EXACT DIMENTIONS DEPEND UPON SIZE OF HORN USED
CLEAT
DIAPHRAGM
6" HORN
9"+-
HOLE FOR 3/8" ROD
4 1/2"+-
3/4" LUMBER
CLEAT
TOP VIEW

THIS small and easily constructed jig saw, built from some scrap wood, a discarded auto horn, and part of an old carburetor, has been found to cut balsa wood accurately and quickly and has proved entirely satisfactory for the model airplane worker. By using very fine scroll blades, this saw will run on six to eight volts from a toy transformer for a considerable time without overheating and will cut one-half-inch balsa cleanly and quickly.

The horn must be of the vibrator type, preferably with the commutator bolted to the diaphragm. Remove the diaphragm and the commutator. Cut a triangular piece from the diaphragm embracing two of the bolt holes on the rim and one for the commutator as shown in the photograph.

The lower blade grip is constructed from one pole from any of the cheap makes of knife switches. This is cut in a manner similar to the grips on an ordinary coping saw and bolted to a short piece of sheet metal which

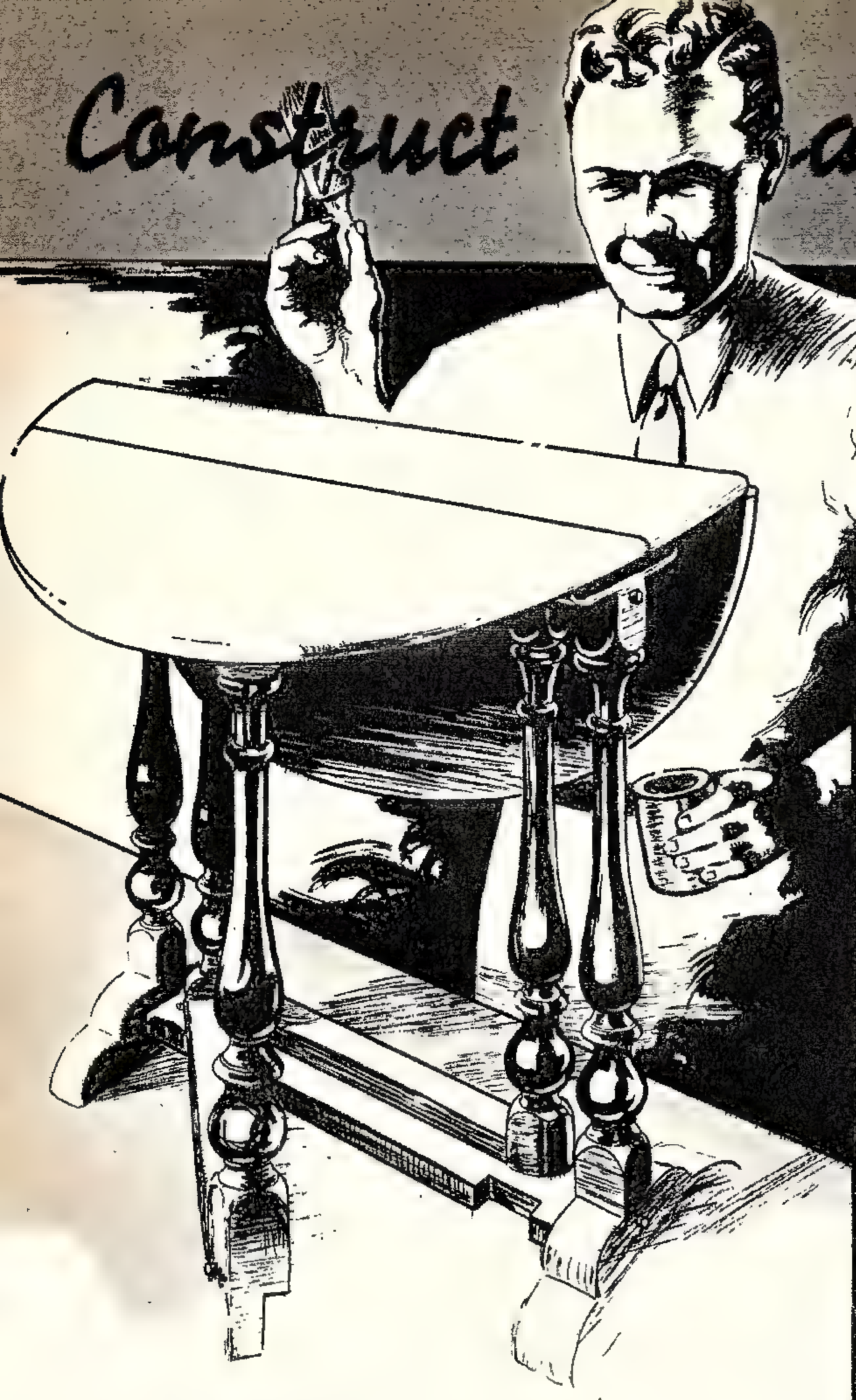
[*Continued on page* 124]


3/8" STEEL ROD
GAS LINE CAP
ONE END FLATTEN & DRILLED
INVERTED CARBURETOR AUXILIARY VALVE
CUT & NOTCH HERE
SPARK PLUG CAP
CUT DOUBLE NOTCHES IN SPARK PLUG CAP
JIG SAW BLADE
SHEET METAL CUT TO SHAPE
NUT
BOLTS
BOLT
NUT
1/2"
MANNER OF NOTCHING BLADE GRIPS
CUT OUT TRIANGULAR SECTION FROM HORN DIAPHRAGM
ASSEMBLY DETAILS
AUTO HORN

Easy to construct, this jig saw will be found very helpful to the model airplane builder. It will cut balsa up to one-half an inch thick. Six to eight volts from a stepdown transformer will power it.

Construct a SMALL

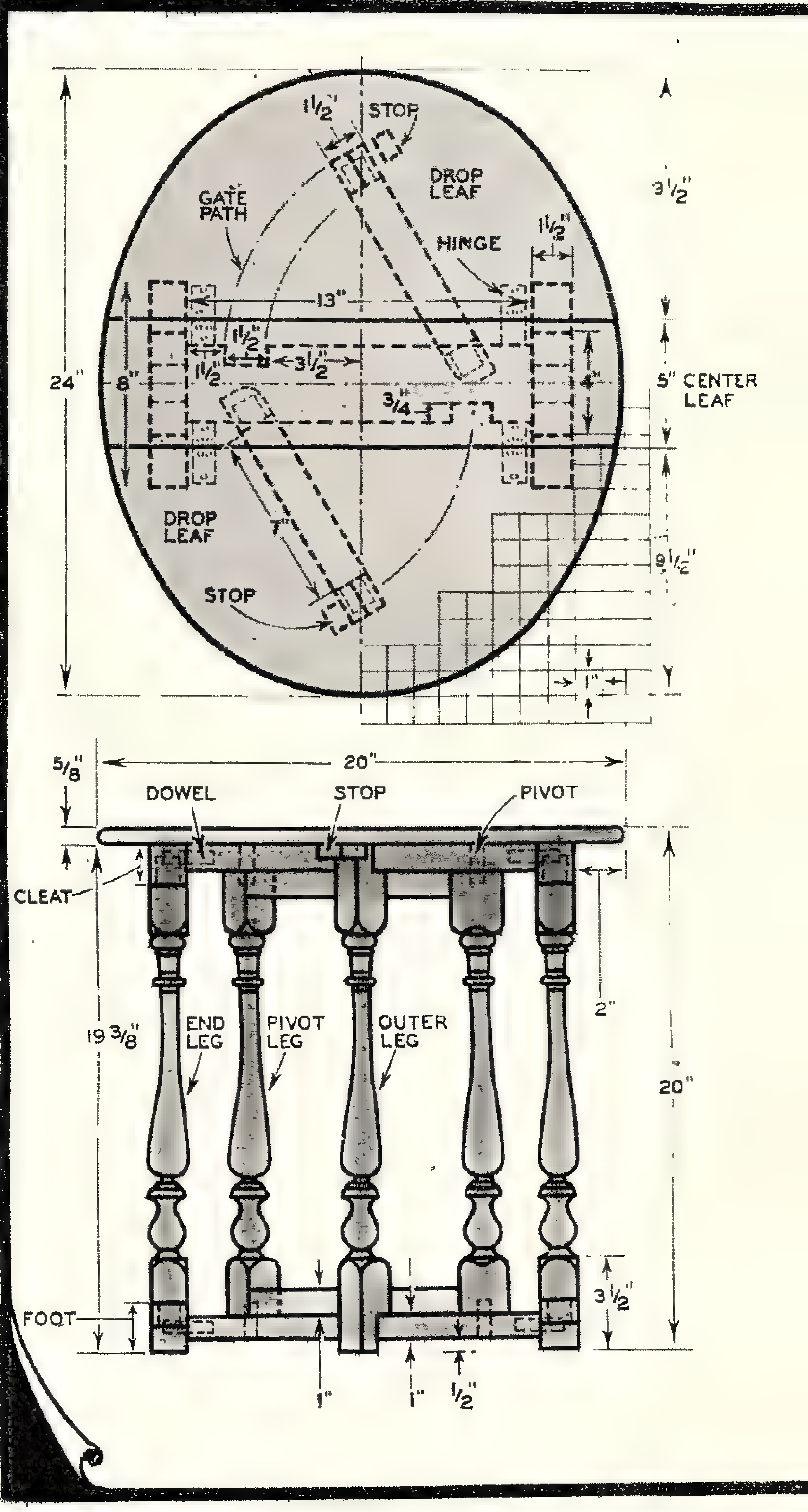
by
John G. Shea



SOMEONE has described certain articles of furniture as possessing the quality of coziness. This quality is amply evinced in the small gate leg table, for it is both cozy and comfortable, and, furthermore, because of its attractive turning, it is a highly decorative piece of furniture.

The person who is interested in wood turning will undoubtedly find a friendly challenge in the construction of this article. Aside from the skill necessary to turn out six duplicate legs, the craftsman will not encounter any unusual complications in its construction. All construction is obvious and not in the least complicated.

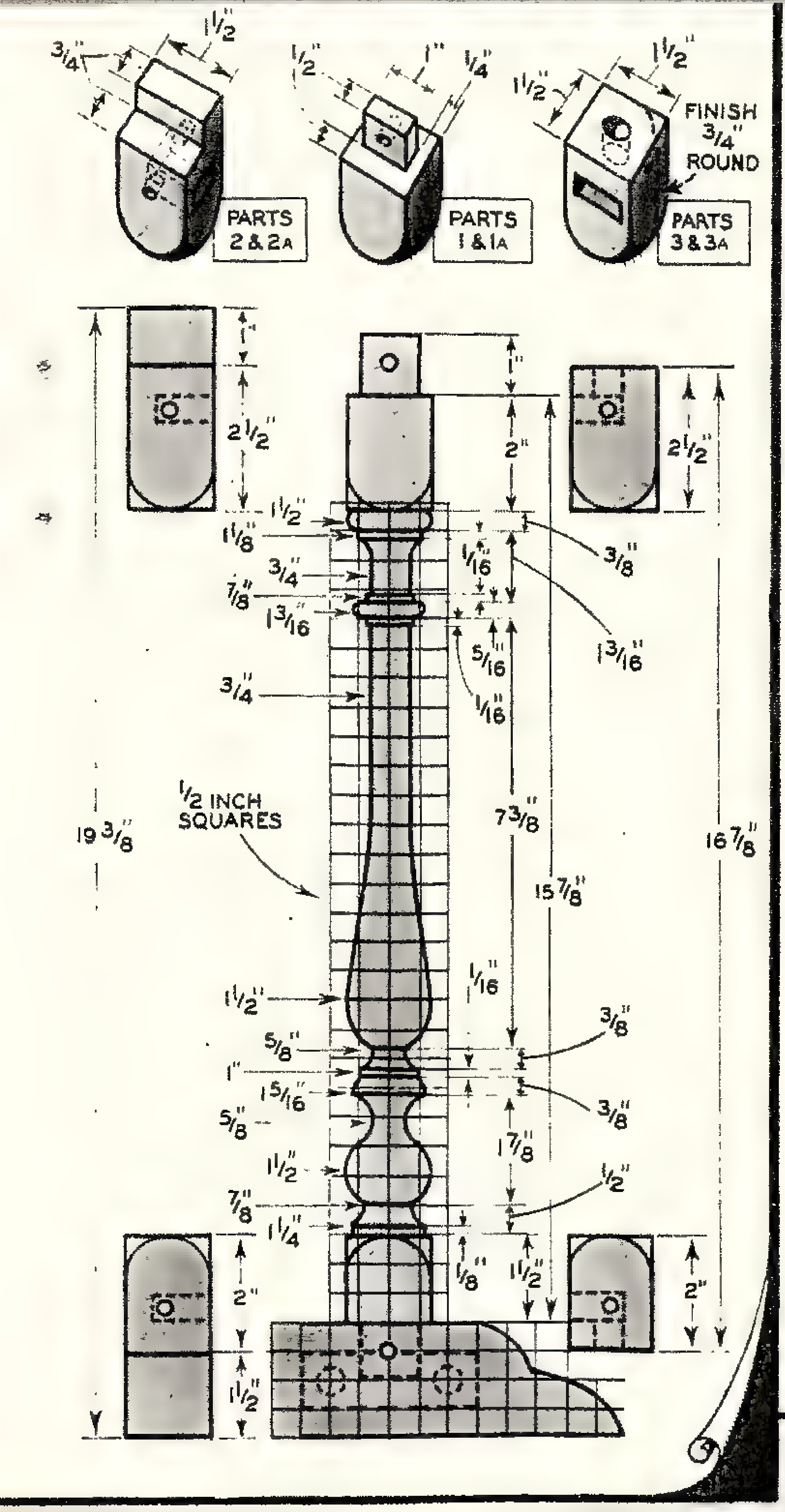
In making this small gate leg table, place emphasis upon all those important "touches" which put good furniture across. Such "touches" include the proper dulling of edges (as indicated in the plan), the use of wooden pegs to both strengthen and lend a quaint crafty appearance to all mortise and tenon joints, and finally a proper finish to give life and warmth to the completed article.



1½"
STOP
DROP LEAF
GATE PATH
HINGE
1½"
13"
3½"
24"
8"
1½"
1½"
3½
¾"
4"
5" CENTER LEAF
DROP LEAF
STOP
9½"
1"
5/8"
20"
DOWEL
STOP
PIVOT
CLEAT
19 3/8"
END LEG
PIVOT LEG
OUTER LEG
2"
20"
3½"
FOOT
1"
1"
½"

If each part is shaped carefully, final assembly will be very simple. Although almost any wood can be used, either walnut or cherry is suggested. A thorough sanding before any finishing is applied will give a more pleasing appearance to the completed project. Plenty of rubbing with a soft cloth will give a warm and attractive luster to the finish.

GATE LEG TABLE


PARTS 2 & 2A
PARTS 1 & 1A
PARTS 3 & 3A
FINISH 3/4" ROUND
1/2 INCH SQUARES
19 3/8"
16 7/8"
15 7/8"
7 3/8"
2 1/2"
1 1/2"
1"
2"
3/4"
1/4"
3/8"
1/16"
13/16"
5/16"
5/8"
15/16"
1 7/8"
1/2"
1 1/4"
7/8"
1/8"
1 1/8"

Any one of a variety of different woods can be used. It is recommended, however, that either walnut or cherry be used.

Note that the sizes given below are of the *finished stock*. Stock should be cut slightly larger than these dimensions to make allowance for dressing and working to actual size.

Turned Members:
- 2 pieces, 1½"x1½"x17⅞" (end posts)
- 2 pieces, 1½"x1½"x19⅜" (gate posts)
- 2 pieces, 1½"x1½"x16⅞" (gate pivot posts)

Because it is necessary to duplicate exactly the turning of all these members, it is suggested that the worker cut an exact and full size pattern of the turning before starting the operation. With this pattern as a guide, the craftsman can readily obtain the exact shaping desired. After the turning is finished, cut mortises and tenons, as indicated in plan, on various turned members. Mark and cut half lap cut-outs on ends of outer gate posts.

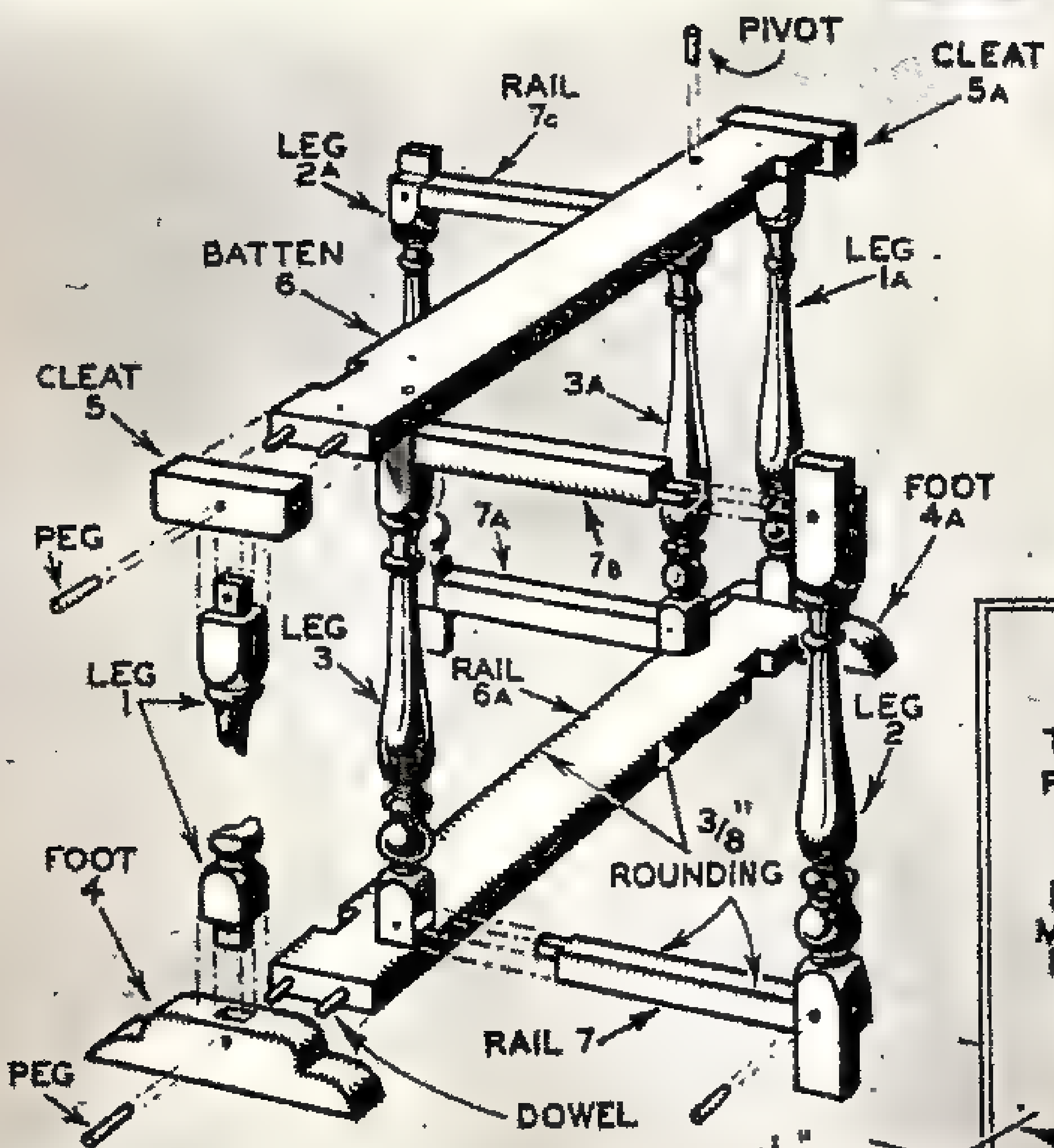
Feet and Top Cleats:
- 2 pieces, 1½"x2"x8" (feet)
- 2 pieces, 1½"x1½"x4" (top cleats)

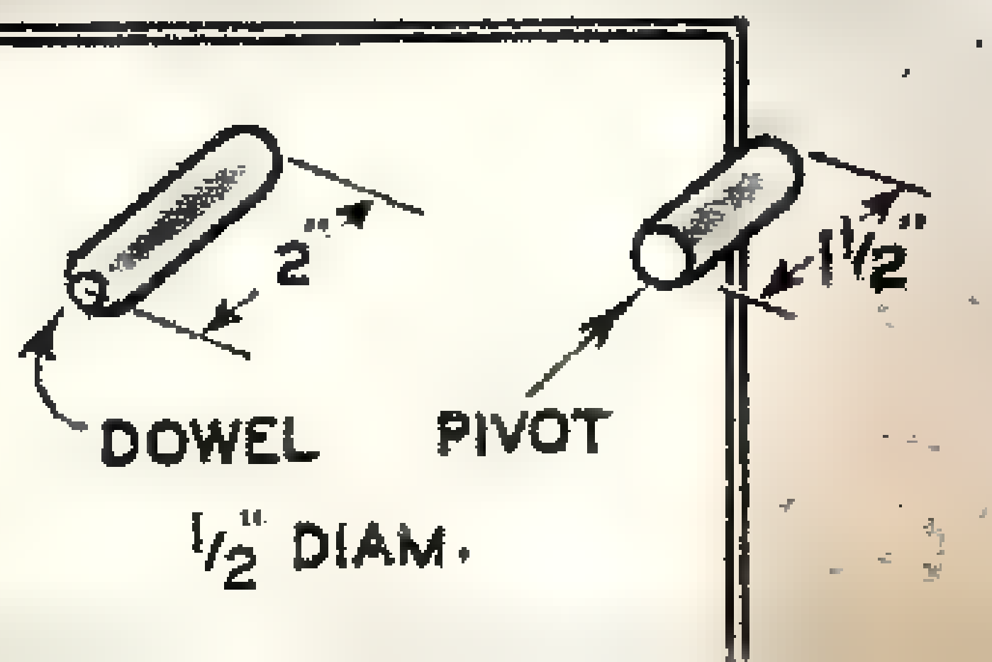
Square to specified sizes. Mark and cut mortises. Cut pattern for foot shaping as indicated in graph detail. Mark this shaping on two opposite faces of each other. Cut and finish to exact shaping of pattern. Round under edge of top cleats.

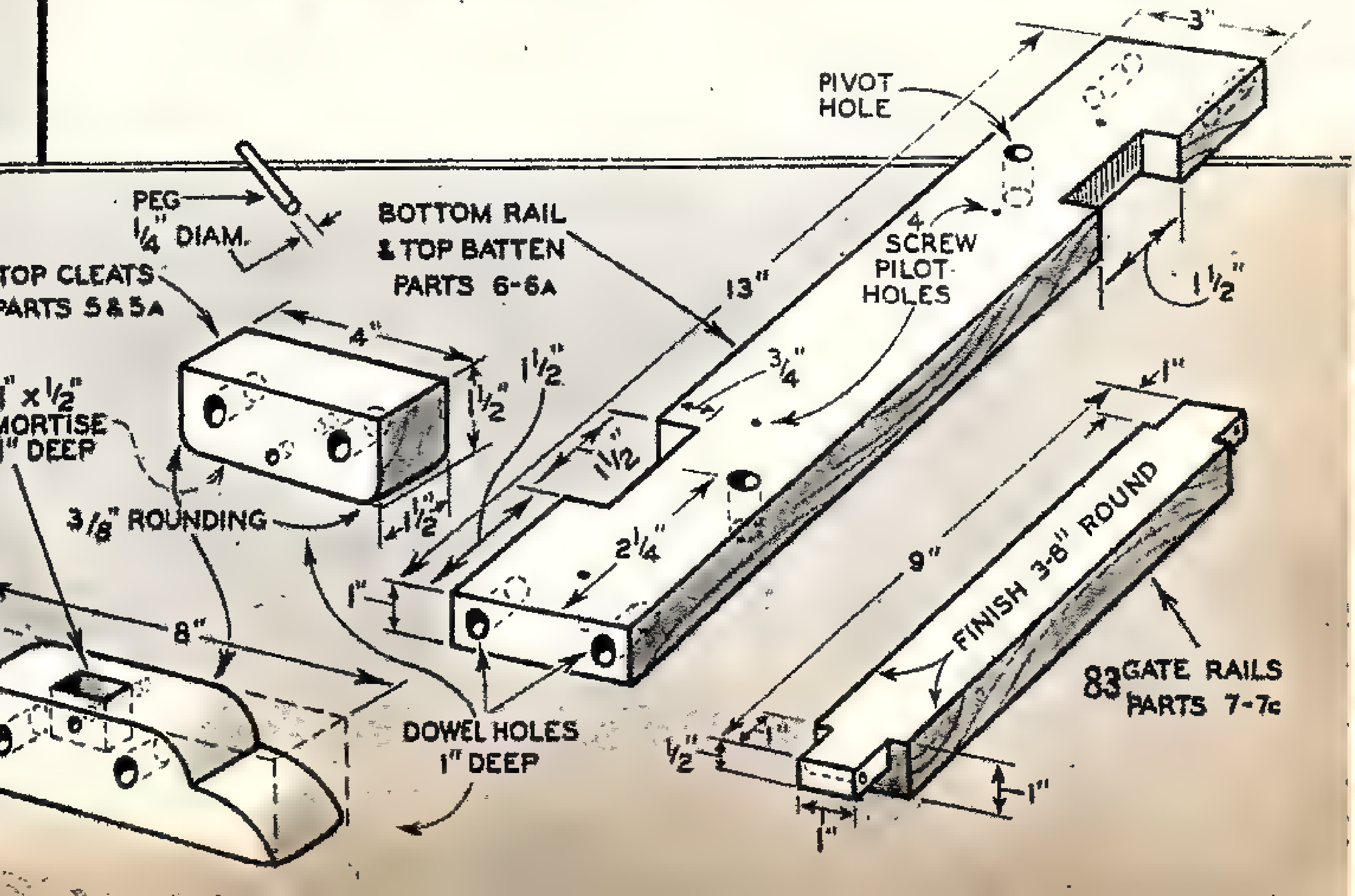
Assemble turned posts to feet and top cleats. Secure joints with glue and insert wooden pins while assembly is being held together under clamp pressure. These pins should be permitted to protrude ⅛" from surface. They are rounded off to give proper quaint pegged effect.

[*Continued on page* 122]

Before turning the legs the builder should make a full-size pattern. With this as a guide, no difficulty should be experienced in turning out exact duplicates. After the turning is finished, the mortises and tenons are cut. The dimensions of the curves shown in the detail can be varied to suit individual taste.


PIVOT
CLEAT 5A
RAIL 7C
LEG 2A
BATTEN 6
LEG 1A
3A
CLEAT 5
PEG
7A
7B
FOOT 4A
LEG 3
LEG 1
RAIL 6A
LEG 2
FOOT 4
3/8" ROUNDING
RAIL 7
PEG
DOWEL


2"
1 1/2"
DOWEL
PIVOT
1/2" DIAM.


3"
PIVOT HOLE
PEG 1/4" DIAM.
BOTTOM RAIL & TOP BATTEN PARTS 6-6A
TOP CLEATS PARTS 5 & 5A
4 SCREW PILOT HOLES
13"
1 1/2"
4"
3/4"
1" x 1/2" MORTISE 1" DEEP
3/8" ROUNDING
2 1/4"
1"
8"
2"
9"
FINISH 3/8" ROUND
DOWEL HOLES 1" DEEP
FEET PARTS 4 & 4A
GATE RAILS PARTS 7-7C
1/2"

HOW TO CUT

Homemade microtome is easy to build and use to get thin sections.

At the upper left is pictured a cross section of a lily flower bud showing all the structural parts of a typical flower. At its right is a longitudinal section of a dandelion flower. Above is shown the hand microtome described in the text.

READERS of preceding articles on microscopy are now familiar with the parts and operation of a microscope, and have made studies of pond life, insects and other introductory matters. They have made temporary slides and a few whole mounts that require little if any technique. So now is the time to take the next and the biggest of all steps in microscopy, and to learn how to cut thin sections and make really professional and permanent slides that can be preserved, sectioned, stained and mounted in balsam.

This is a sizeable job and the whole story cannot be told in a single chapter. In the present installment we shall go into the details of cutting thin sections, and other stages in microtechnique will follow along in succeeding issues.

Sectioning—the cutting of thin slices—is necessary whenever the material to be observed under the microscope combines thickness with opacity, and this is usually the case. It is possible to secure surface views of such objects as skin, liver or heart, and of stems, leaves, stones and minerals; but generally it is impossible or inadvisable to try to make permanent mounts of most of these, and no information at all is obtained of the internal

This is the eighth in a series of articles published by MODERN MECHANIX on this fascinating subject of microscopy. Previous articles are as follows:

April—"Documentary Evidence"—A study of the characteristics of handwriting and typewriting, and how the microscope is used to track down law breakers.

March—"The Silent Sherlock"—The microscope and its use in present day crime detection.

February—"Finger Prints in Fur"—How the microscope is used by the fur industry for identification purposes.

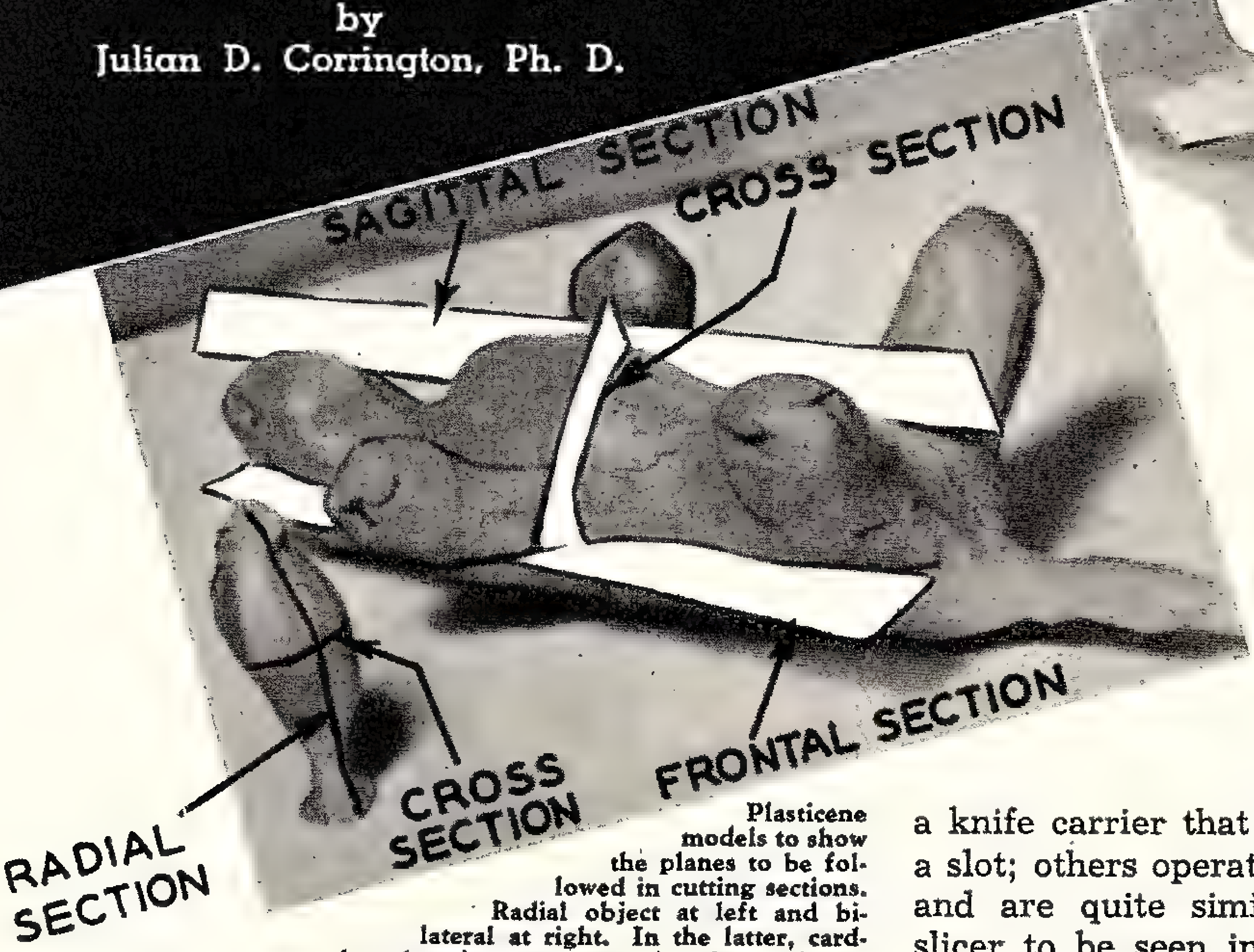
December—"Hitching a Microscope to Your Camera"—How a camera can be used with a microscope to preserve the wonders seen by the eye.

November—"The Autumn Empire of Insects"—The thrills of big game hunting are revealed under the lense of the microscope in the study of common insect species.

October—"Microscope Reveals Mysteries of Life in Water"—How to delve into the wonders of nature with a microscope as your magic key to the storehouse of life at its conception.

SECTIONS FOR YOUR MICROSCOPE

by
Julian D. Corrington, Ph. D.



Plasticene models to show the planes to be followed in cutting sections. Radial object at left and bilateral at right. In the latter, cardboard strips represent the three planes.

structure or of the kinds of cells that make up plant and animal organs.

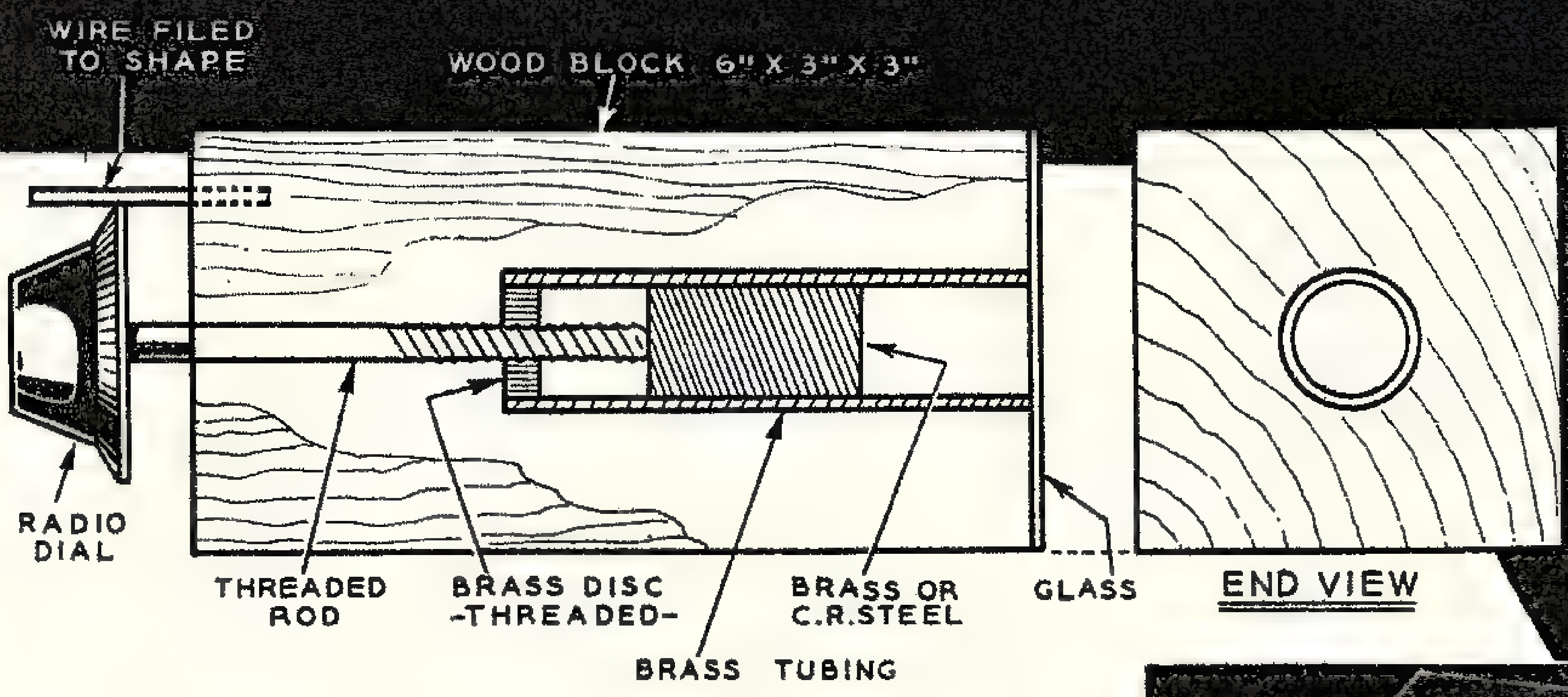
Slices thin enough to permit the use of transmitted light are necessary and so a complicated technique of procedures has grown up to serve this need and to prepare the beautiful and permanent slides that are in common use in high school and college courses in biology.

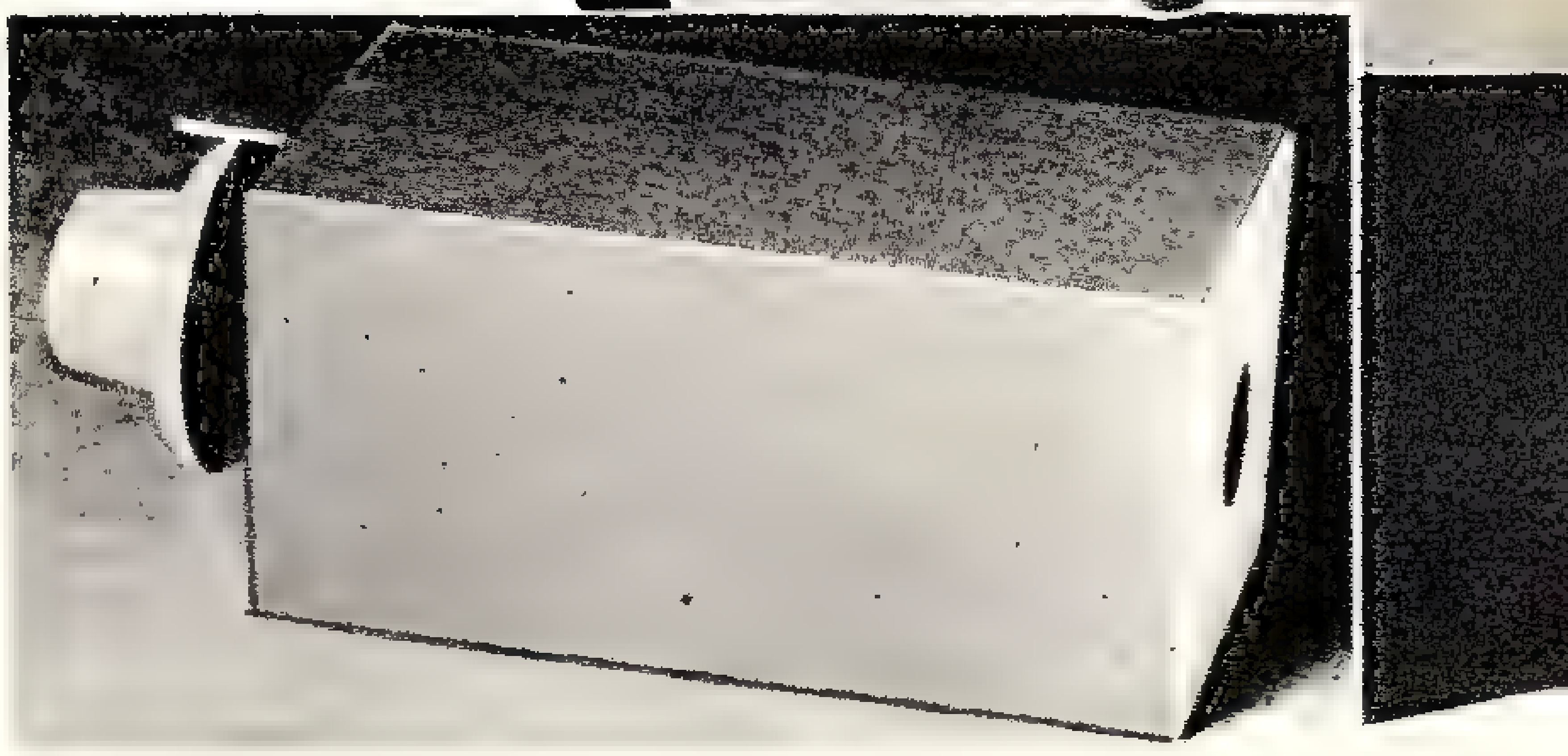
If you have never seen this sort of slide we suggest that you purchase one from a supply house or dealer so as to have it as a model in making your own. Ask for a cross section of basswood or other tree stem or of lily flower bud, double stained. On the blank glass slide has been placed an exceedingly thin section of the material, permanently preserved against decay and stained with various dyes to give color and contrast to otherwise almost transparent structures. The section has been rendered translucent by means of an oil and has been placed in Canada balsam and then a cover glass added. After thorough drying to harden the balsam, the slide was cleaned and labeled. It is such a slide that we are going to make, taking one of the major steps this month.

Advanced and detailed studies may require sections that are not only very thin, but of a known and uniform thinness, and hence there have been developed a number of types of precision instruments known as *microtomes,* from the Greek words *small,* and *to cut.* Some use a knife carrier that slides back and forth in a slot; others operate on the rotary principle and are quite similar to the rotary meat slicer to be seen in a meat market. Some one, in fact, referred to this style of microtome as "a glorified meat slicer." Machine microtomes cost from fifteen to several hundred dollars. For all ordinary and practical purposes, however, a hand microtome, as described in this article will do the trick and can be made by anyone familiar with the use of tools.

First, though, there is the free-hand method of cutting sections which employs no microtome at all, and whether or not you plan to operate a microtome you should know and practice this system. Every microscopist worthy of the name should go through this step in his training and acquire a bit of the necessary manual dexterity, so often lacking in this machine age.

Recommended as practice material at this season of the year are leaf buds from trees, particularly the larger types, such as horse chestnut. The knife may be either the old-fashioned razor, as shown in an accompanying illustration, or a safety-razor blade held in a carrier with folding handle—an object commonly sold in the five and ten cent stores. The stiff type of blade is better for our purposes than the flexible one. New blades are readily inserted in the carrier when the one in use becomes dulled. Hard woods





Above are details for constructing microtome. At upper right is shown the method of cutting free-hand sections as described in text.

will ruin a razor for sectioning purposes after only two or three slices, softer ones after a dozen or so. Other kinds of tissue that cut more easily may yield as many as a hundred; but in any case the time arrives when a change of blade or a sharpening of the old-fashioned razor is indicated. Crushed, torn or otherwise mutilated or distorted sections are as certain as they are undesirable when a dull blade is used.

Now for the job. Sit at a table so that both elbows may be supported on the table top, or sit in a chair away from a table and hold the elbows pressed firmly in to the sides. Hold the bud between thumb and forefinger of the left hand and knife in the right. Place the knife blade upon the left forefinger, flat, cutting edge toward the body, the finger horizontal. The motion of cutting is that of paring, not that of whittling; i.e., the blade is pulled along the forefinger, toward you, the finger serving as a guide. A long sliding cut is made, starting with the heel of the razor and passing to its toe, coming along the fore finger toward your body.

Have both the bud and the razor blade wet with water and cut slowly and carefully at first, increasing the speed as skill develops. Practice in cutting sections thinner and thinner until extremely thin ones are obtained. Keep knife blade and bud surface wet. Avoid wedges—thicker on one edge than another.

As fast as sections are cut, float them off the knife into a shallow vessel of water, or transfer them from knife to water with a camel's hair brush. The fingers are too indelicate for this, and sections should never be touched by the hands. After a number have thus been executed, reject all but a few of the very best and thinnest, saving these for further attention, as described later on.

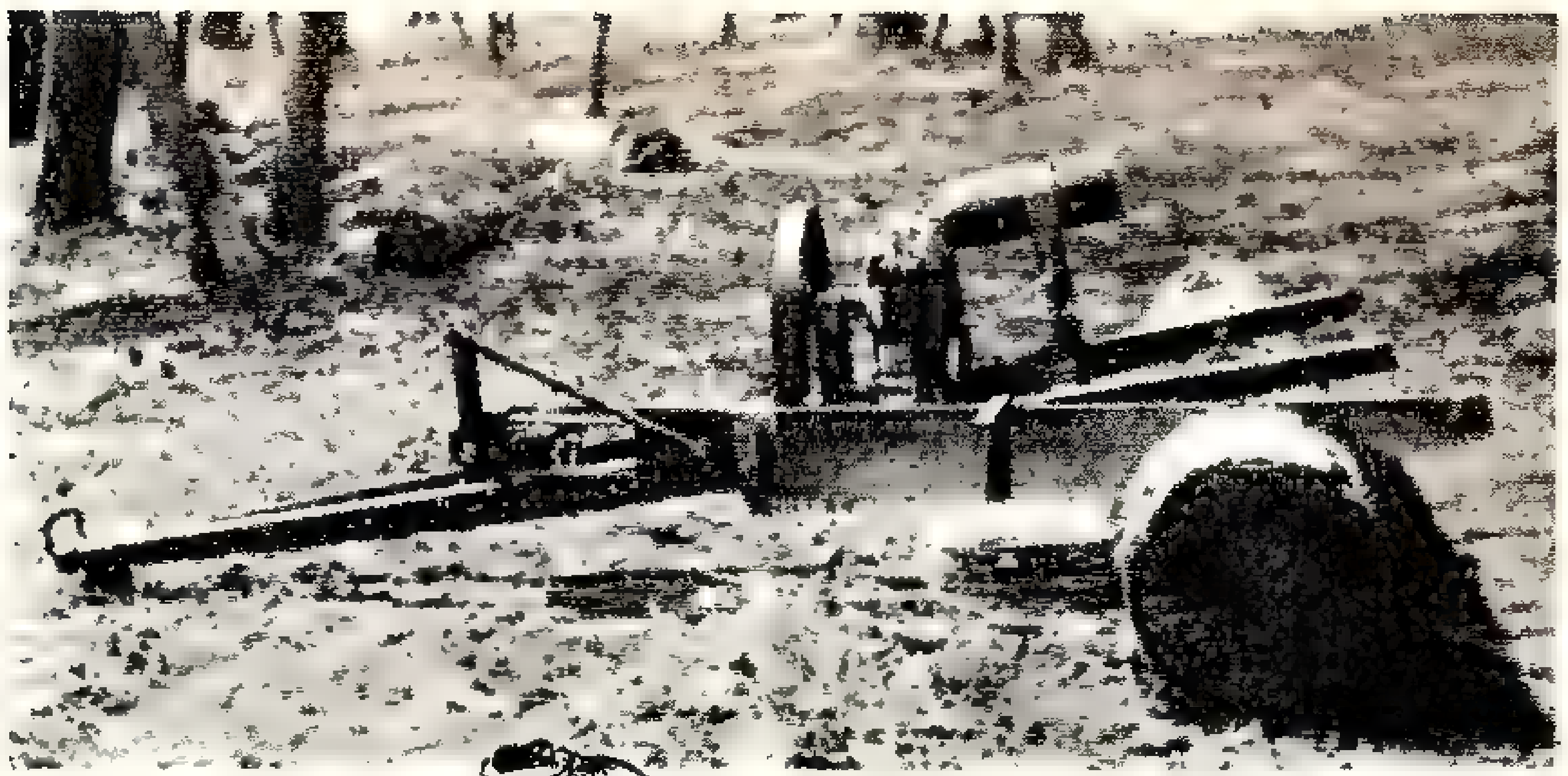
The hand or well microtome consists of a hollow tube as a holder for the object to be cut. The bottom of this tube is raised very gradually by turning a screw, in that way raising the object a given and uniform amount with each turn, permitting sections of known and even thinness. The cutting platform or surface is a very smooth one, as plate glass, and the razor blade is guided on a slanting stroke across this surface. After each slice the screw is turned a designated amount and another cut made. Sections are then floated off in water, as before, and only the best ones retained.

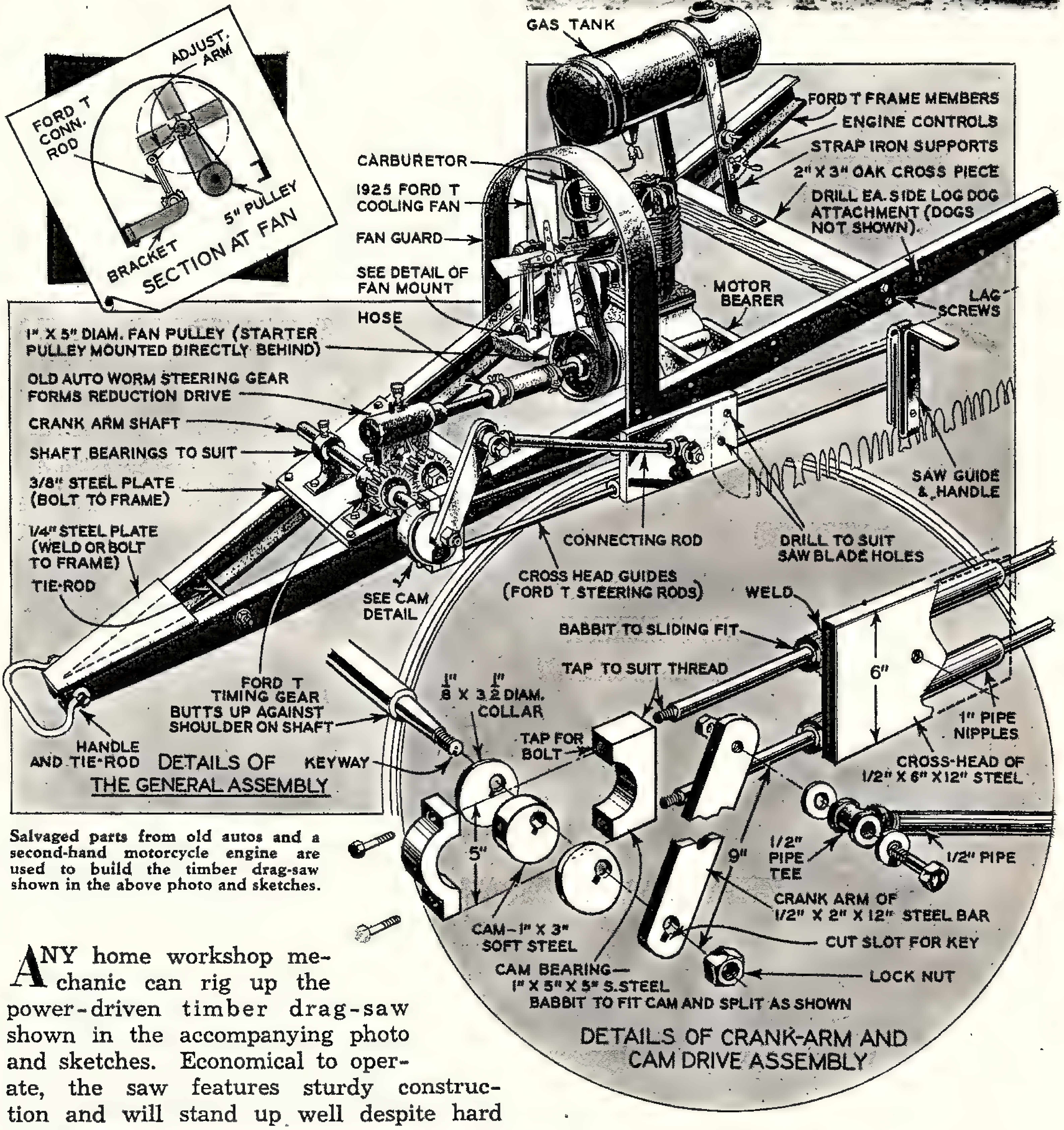
A block of hard wood such as maple, about 6″ long and 3″ square in cross section is bored part way down the middle from one end to receive and hold tightly a length of rather heavy-walled brass tubing of approximately ¾″ bore. The rest of the length of the wooden block is drilled to receive the threaded brass or steel rod, hereafter referred to as the screwrod. The threading should be carefully done and have as many threads to the inch as possible. If you cannot do this for yourself, have it done, or purchase and use an ordinary bolt, diameter about ¼″.

Next braze a thick brass disc into the lower end of the brass tube, then drill and tap it accurately in the center to receive the screw-rod. Again, if you do not have access to the proper machinery, a nut for the bolt can be centered in the tube end and held there with plastic wood. The tube may now be driven into the block, plugged end inward. Insert in this tube a shorter length of brass or steel rod which makes a neat sliding fit;

[*Continued on page* 134]

A Home-Made DRAG-SAW




ADJUST. ARM
FORD T CONN. ROD
5" PULLEY
BRACKET
SECTION AT FAN
GAS TANK
FORD T FRAME MEMBERS
ENGINE CONTROLS
STRAP IRON SUPPORTS
2" X 3" OAK CROSS PIECE
DRILL EA. SIDE LOG DOG ATTACHMENT (DOGS NOT SHOWN).
CARBURETOR
1925 FORD T COOLING FAN
FAN GUARD
SEE DETAIL OF FAN MOUNT
MOTOR BEARER
LAG SCREWS
HOSE
1" X 5" DIAM. FAN PULLEY (STARTER PULLEY MOUNTED DIRECTLY BEHIND)
OLD AUTO WORM STEERING GEAR FORMS REDUCTION DRIVE
CRANK ARM SHAFT
SHAFT BEARINGS TO SUIT
3/8" STEEL PLATE (BOLT TO FRAME)
1/4" STEEL PLATE (WELD OR BOLT TO FRAME)
TIE-ROD
SAW GUIDE & HANDLE
CONNECTING ROD
DRILL TO SUIT SAW BLADE HOLES
SEE CAM DETAIL
CROSS HEAD GUIDES (FORD T STEERING RODS)
WELD
BABBIT TO SLIDING FIT
TAP TO SUIT THREAD
6"
FORD T TIMING GEAR BUTTS UP AGAINST SHOULDER ON SHAFT
1/8" X 3 1/2" DIAM. COLLAR
TAP FOR BOLT
1" PIPE NIPPLES
HANDLE AND TIE-ROD
DETAILS OF THE GENERAL ASSEMBLY
KEYWAY
CROSS-HEAD OF 1/2" X 6" X 12" STEEL
5"
9"
1/2" PIPE TEE
1/2" PIPE
CRANK ARM OF 1/2" X 2" X 12" STEEL BAR
CAM-1" X 3" SOFT STEEL
CUT SLOT FOR KEY
CAM BEARING— 1" X 5" X 5" S. STEEL BABBIT TO FIT CAM AND SPLIT AS SHOWN
LOCK NUT
DETAILS OF CRANK-ARM AND CAM DRIVE ASSEMBLY

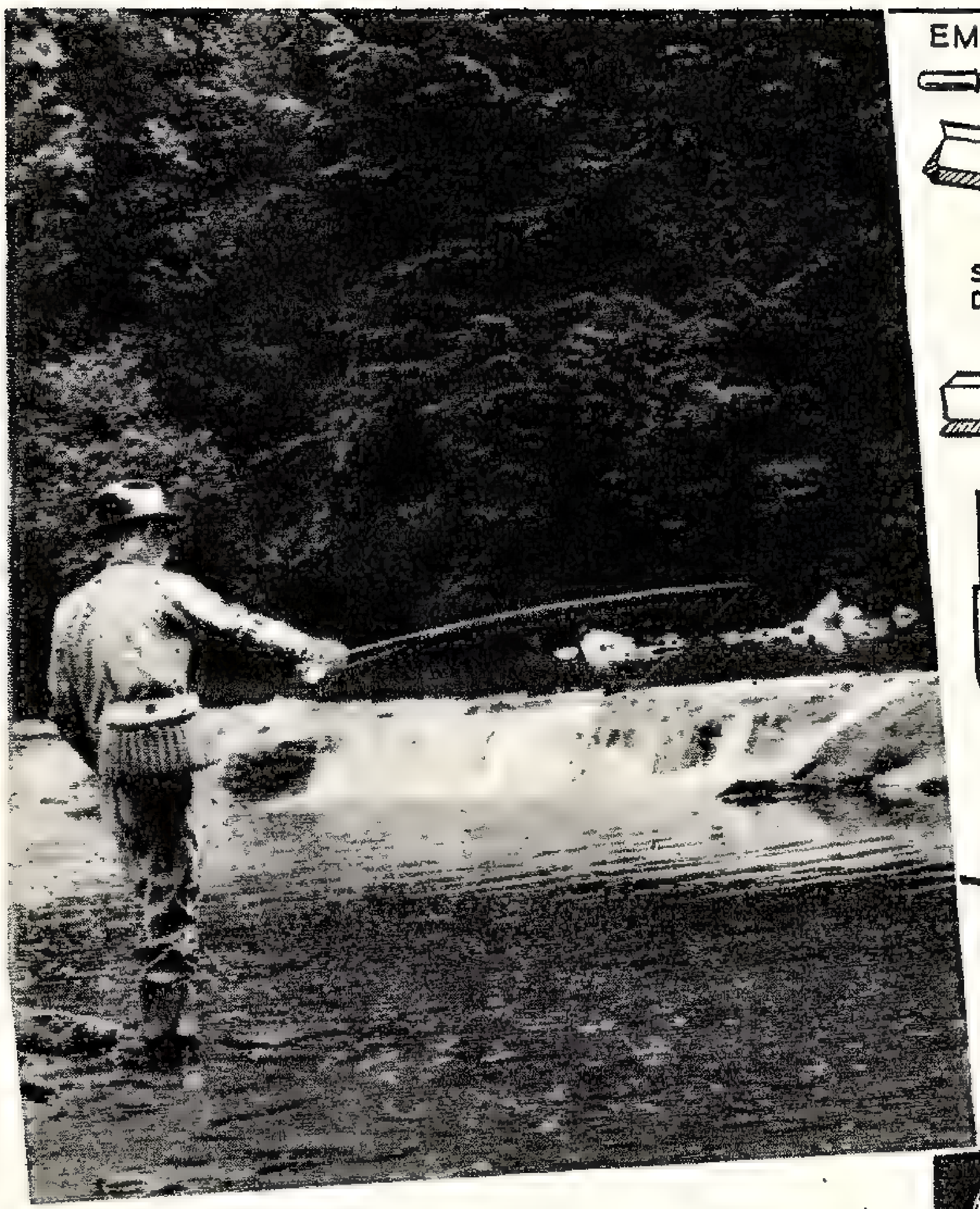
Salvaged parts from old autos and a second-hand motorcycle engine are used to build the timber drag-saw shown in the above photo and sketches.

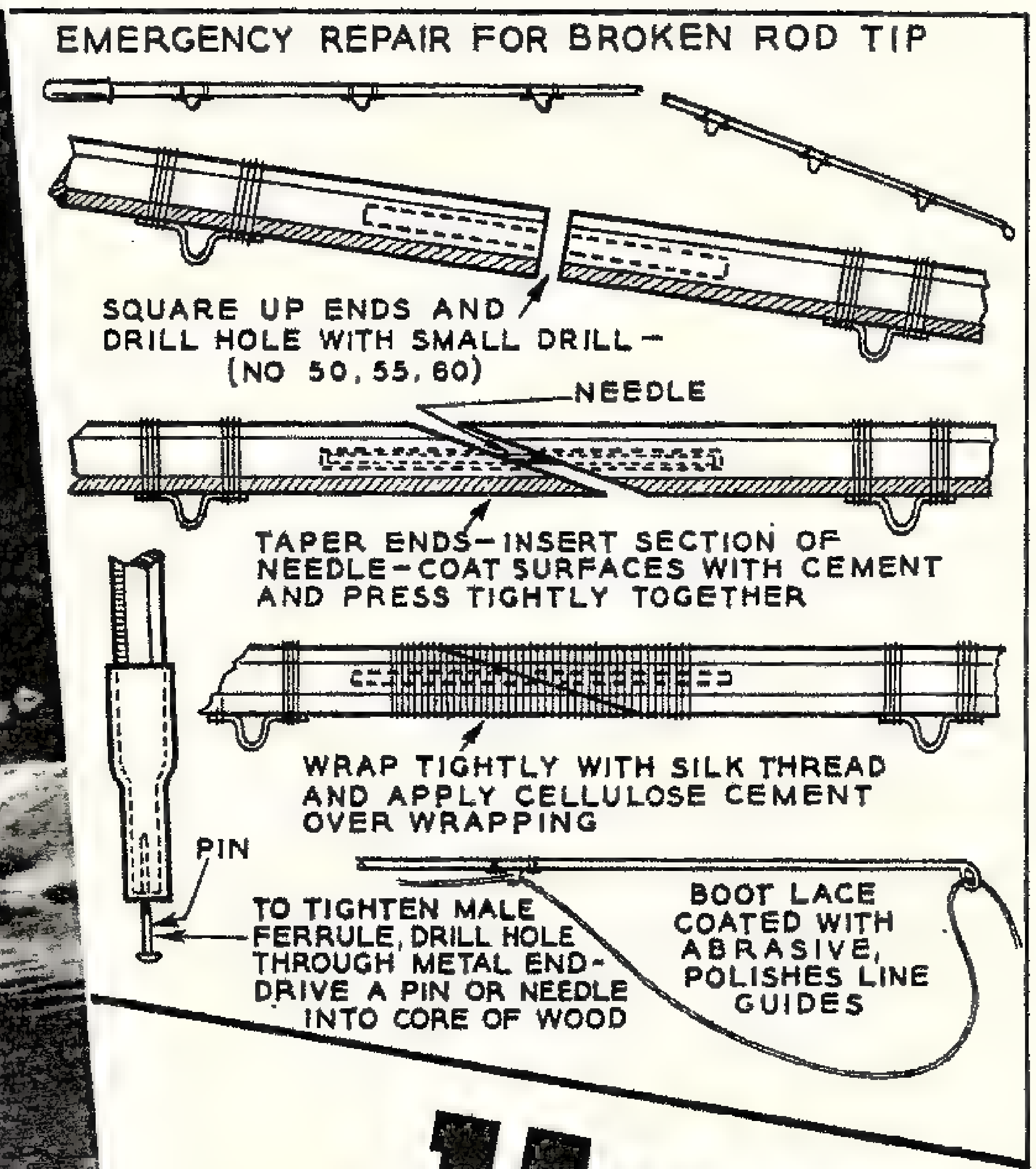
ANY home workshop mechanic can rig up the power-driven timber drag-saw shown in the accompanying photo and sketches. Economical to operate, the saw features sturdy construction and will stand up well despite hard daily usage.

The frame is made from chassis members of an old model T Ford, riveted or bolted together in the form of a triangle. The power is provided by a second-hand motorcycle engine fitted with an extended drive shaft to which two five-inch pulleys are attached, as shown in the sketches.

One of the pulleys is used to start the engine, a rope being wound around it and the pulley spun by pulling heavily and quickly on the rope end. The other pulley, by means of a belt, is used to rotate a fan that serves to cool the engine. The fan is mounted on

[*Continued on page* 124]



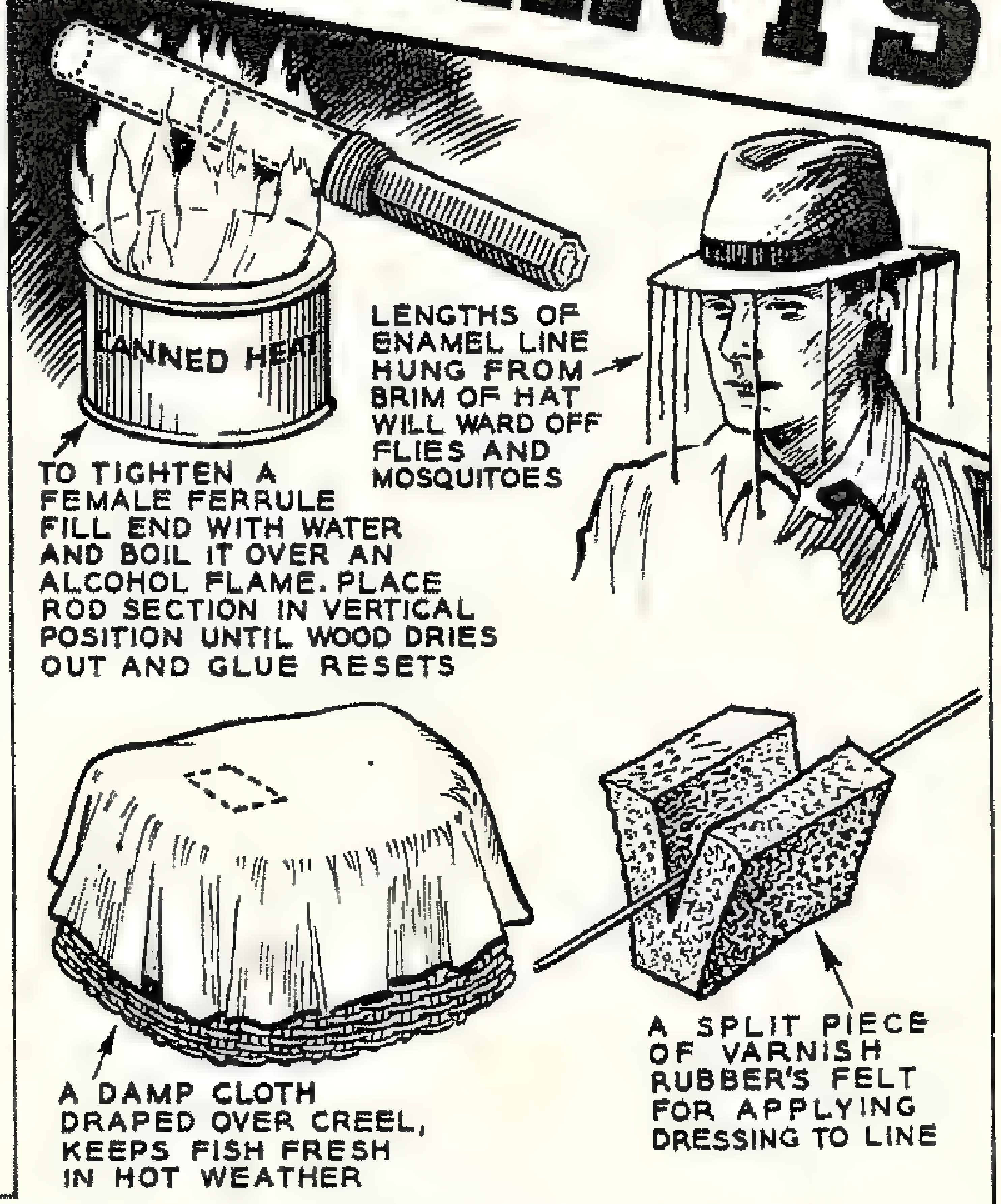

EMERGENCY REPAIR FOR BROKEN ROD TIP
SQUARE UP ENDS AND DRILL HOLE WITH SMALL DRILL— (NO 50, 55, 60)
NEEDLE
TAPER ENDS—INSERT SECTION OF NEEDLE—COAT SURFACES WITH CEMENT AND PRESS TIGHTLY TOGETHER
WRAP TIGHTLY WITH SILK THREAD AND APPLY CELLULOSE CEMENT OVER WRAPPING
PIN
TO TIGHTEN MALE FERRULE, DRILL HOLE THROUGH METAL END-DRIVE A PIN OR NEEDLE INTO CORE OF WOOD
BOOT LACE COATED WITH ABRASIVE, POLISHES LINE GUIDES

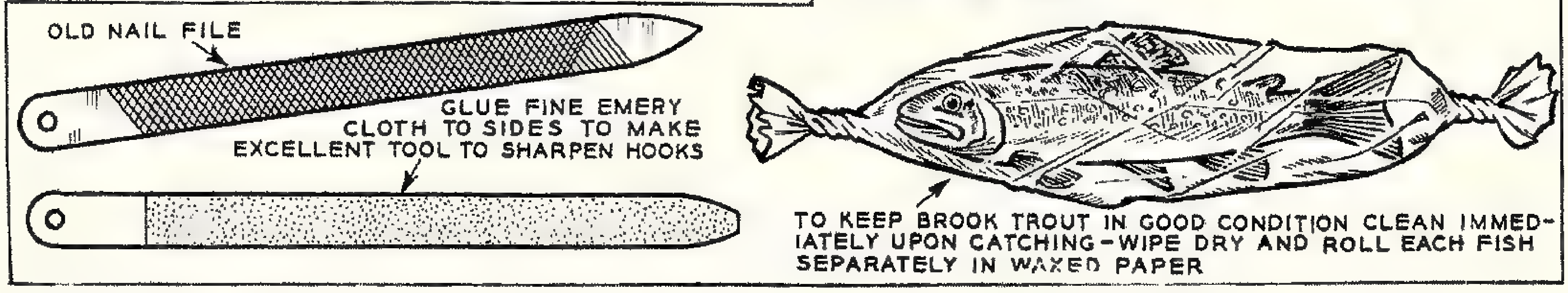
HINTS

by Dick Cole

FISHING can probably be classed as one of the most universal and cosmopolitan of all outdoor sports. It is quite safe to say that it plays a part in every man's life at some time or other, perhaps beginning with a hickory branch, grocery store cord and a bent pin, and leading up to the prized possession of a "Thomas" or "Hardy" rod, taper lines, and a vast collection of lures and flies.

Fishing—angling—is becoming a truer sport every year. Our forefathers fished solely to get fish. We of today fish for the joy of outwitting the fish with artifice. Our forefathers' tackle consisted of a solid bamboo "pole" with a length of 10-cent linen line tied to it—no reel; eyed hooks at 5 cents a dozen, a can of worms and a rusty nut for a sinker. The angler's tackle of


CANNED HEAT
TO TIGHTEN A FEMALE FERRULE FILL END WITH WATER AND BOIL IT OVER AN ALCOHOL FLAME. PLACE ROD SECTION IN VERTICAL POSITION UNTIL WOOD DRIES OUT AND GLUE RESETS
LENGTHS OF ENAMEL LINE HUNG FROM BRIM OF HAT WILL WARD OFF FLIES AND MOSQUITOES
A DAMP CLOTH DRAPED OVER CREEL, KEEPS FISH FRESH IN HOT WEATHER
A SPLIT PIECE OF VARNISH RUBBER'S FELT FOR APPLYING DRESSING TO LINE


OLD NAIL FILE
GLUE FINE EMERY CLOTH TO SIDES TO MAKE EXCELLENT TOOL TO SHARPEN HOOKS
TO KEEP BROOK TROUT IN GOOD CONDITION CLEAN IMMEDIATELY UPON CATCHING—WIPE DRY AND ROLL EACH FISH SEPARATELY IN WAXED PAPER

Broken rods can be quickly repaired by splicing the break in the manner described in the details at upper right. Lower illustrations show how a loose ferrule may be tightened simply by heating it over a canned heat flame. To ward off annoying insects the fisherman may attach lengths of old fishline to the brim of his hat. A quick way to apply dressing to a fishing line is to split a piece of varnish-rubber felt to form an applicator. To keep fish from spoiling, clean and wrap in waxed paper.

today can easily run into three, or even four figures.

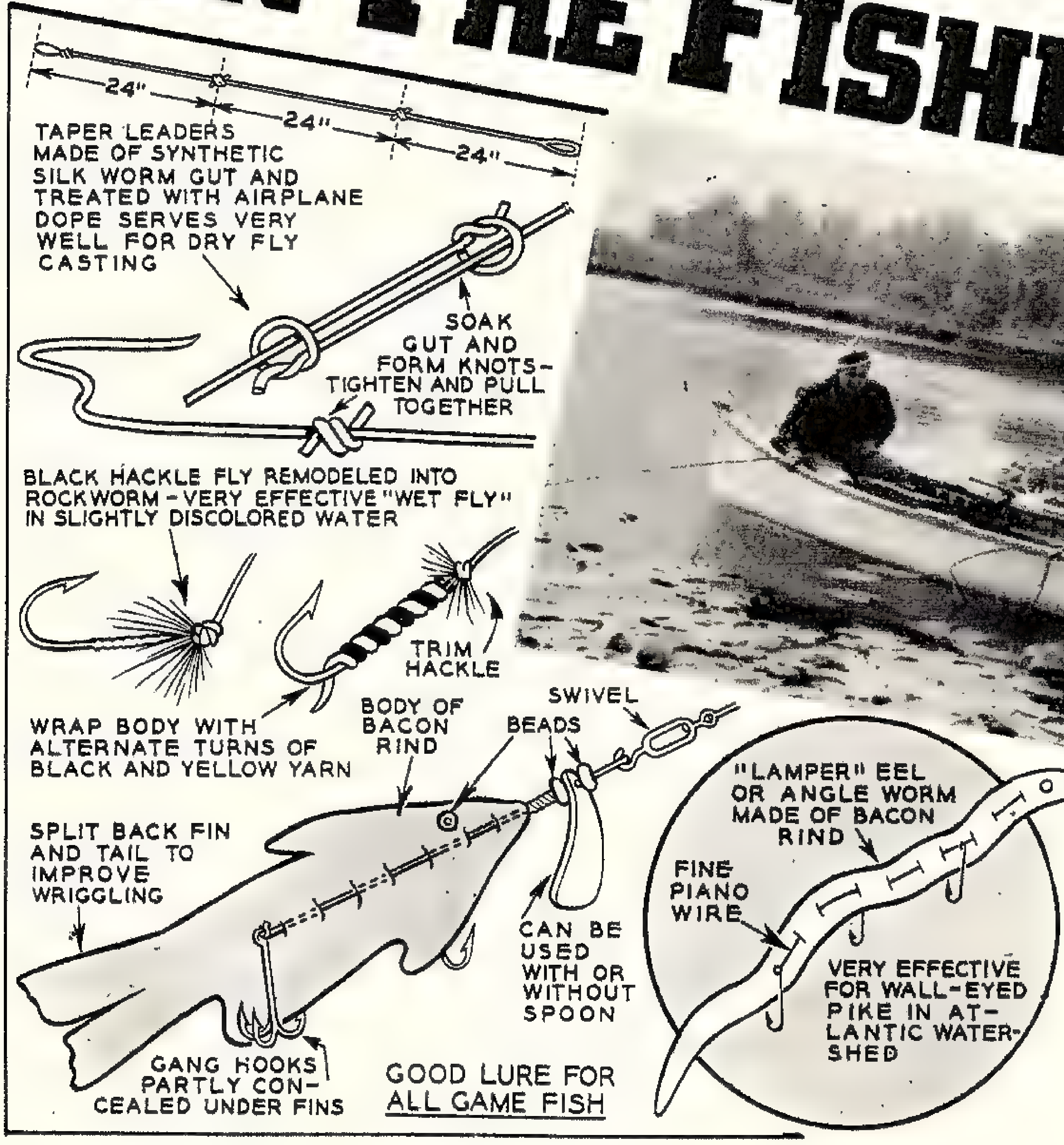
However, to gain full enjoyment of angling as a sport, it is not necessary to invest a large sum of money. Perhaps a $10.00 domestic rod will not handle a $2.00 "level" line with the same nicety that a $150.00 tournament rod will handle a $15.00 double taper line, but, when the two outfits are put to actual use on a stream, maybe the $12.00 outfit will out-fish the aristocratic equipment. It really is the man at the butt-end of the rod that decides the issue.

It is not the intention of this article to give a treatise on the art of bait and fly casting, but rather to pass along to fellow anglers a few little kinks that may aid them in gaining a fuller enjoyment of their favorite sport.

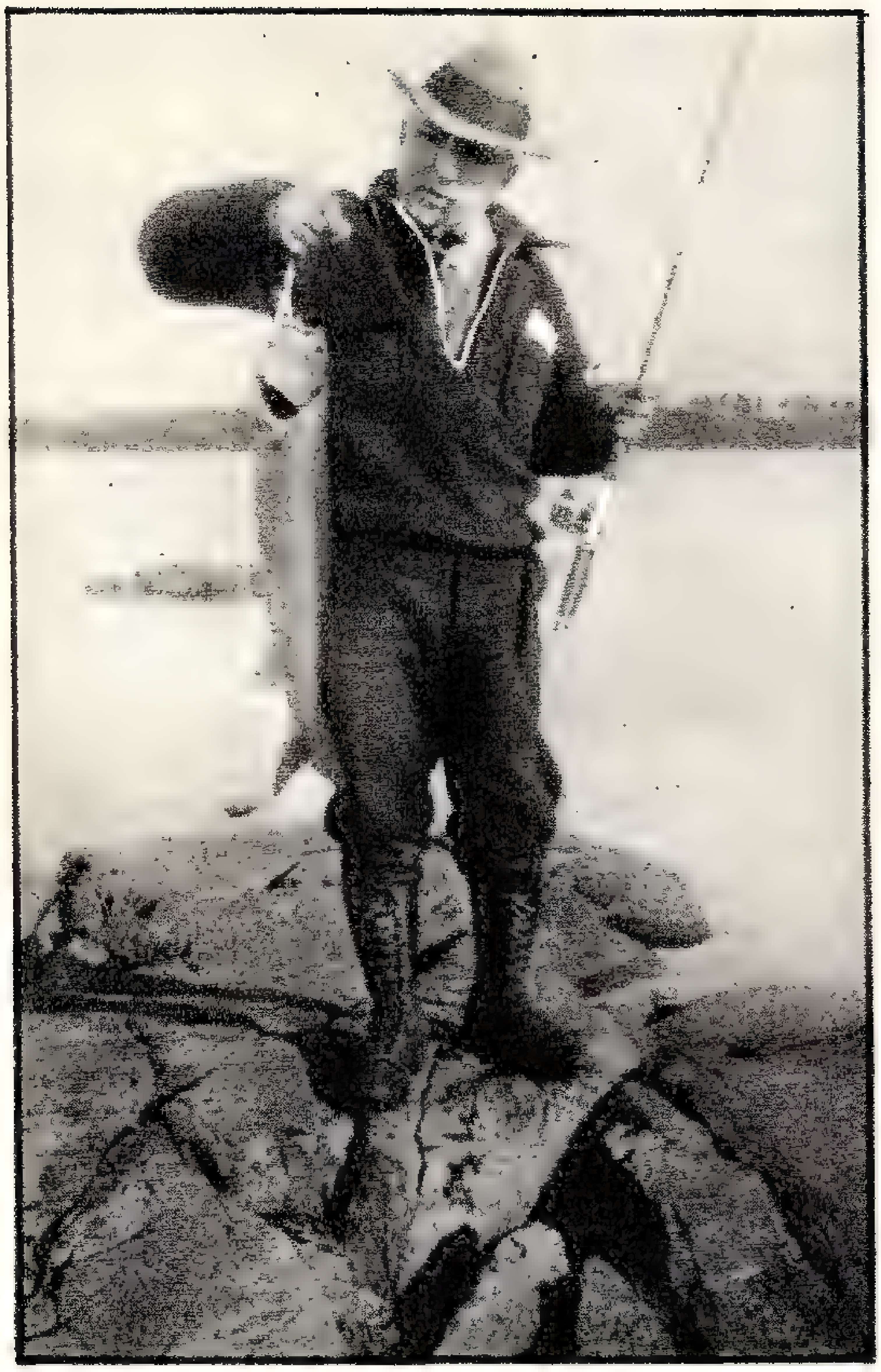
What can be more annoying than to break a flyrod tip section far from camp? However, a satisfactory repair job can be made right on the stream if the angler carries some simple equipment with him. This consists of a packet of needles of assorted sizes, a tube of celluloid cement, several small twist drills—say, No. 50, 55 and 60—and a spool of strong silk thread.

To proceed with the repair job, the broken ends

FOR THE FISHERMAN


24"
24"
24"
TAPER LEADERS MADE OF SYNTHETIC SILK WORM GUT AND TREATED WITH AIRPLANE DOPE SERVES VERY WELL FOR DRY FLY CASTING
SOAK GUT AND FORM KNOTS-TIGHTEN AND PULL TOGETHER
BLACK HACKLE FLY REMODELED INTO ROCKWORM - VERY EFFECTIVE "WET FLY" IN SLIGHTLY DISCOLORED WATER
TRIM HACKLE
WRAP BODY WITH ALTERNATE TURNS OF BLACK AND YELLOW YARN
BODY OF BACON RIND
BEADS
SWIVEL
SPLIT BACK FIN AND TAIL TO IMPROVE WRIGGLING
CAN BE USED WITH OR WITHOUT SPOON
GANG HOOKS PARTLY CONCEALED UNDER FINS
GOOD LURE FOR ALL GAME FISH
"LAMPER" EEL OR ANGLE WORM MADE OF BACON RIND
FINE PIANO WIRE
VERY EFFECTIVE FOR WALL-EYED PIKE IN ATLANTIC WATERSHED

Every fisherman derives more satisfaction from the sport when he is able to land his catch with lures of his own creation. Several effective lures are shown above. A black hackle fly can be made into an effective "wet-fly" by wrapping the hook with alternate turns of black and yellow yarn. A good lure for all game fish can be made from bacon rind as shown in the lower detail.



While this fish was taken with an expensive rod, there is just as much fun landing your catch with a bamboo pole.

are first squared up, then the most suitably sized drill is used to bore a hole in the core of each broken section. This can be done by rolling the drill in the fingers, or a pair of pliers can be used. Next, the ends are beveled off accurately. A needle is now selected which fits tightly into the hole. The point and eyes of the needle are broken off, and the steel body is inserted in the hole. Before bringing the joining surfaces together, coat each one with celluloid cement. When the cement becomes "tacky", press the surfaces tightly together. Wait for a few minutes for the cement to set, then wrap the joint with silk thread and apply several coats of cement to the finished wrapping. Set the rod section in the direct sunlight, and fill up the old pipe, and when the smoke is finished, the rod will be ready for use.

Loose, shaky ferrules on a rod are a nuisance. The remedy is simple. Fill the female ferrule with water and boil it carefully over an alcohol flame or over the camp stove. This will soften the glue. When it resets, the ferrule will be firm. A drop of thin, water-mixed glue dropped into the ferrule will aid. A loose male ferrule can be tightened by driving a pin or a needle into the wood.

Line guides and tip should be kept polished to provide a free-running line. An ordinary boot-lace, coated with a fine abrasive, will do the trick. Fine "grinding in" compound or pumice will serve. For an extra high polish use "Fuller's earth" or a silver polish powder.

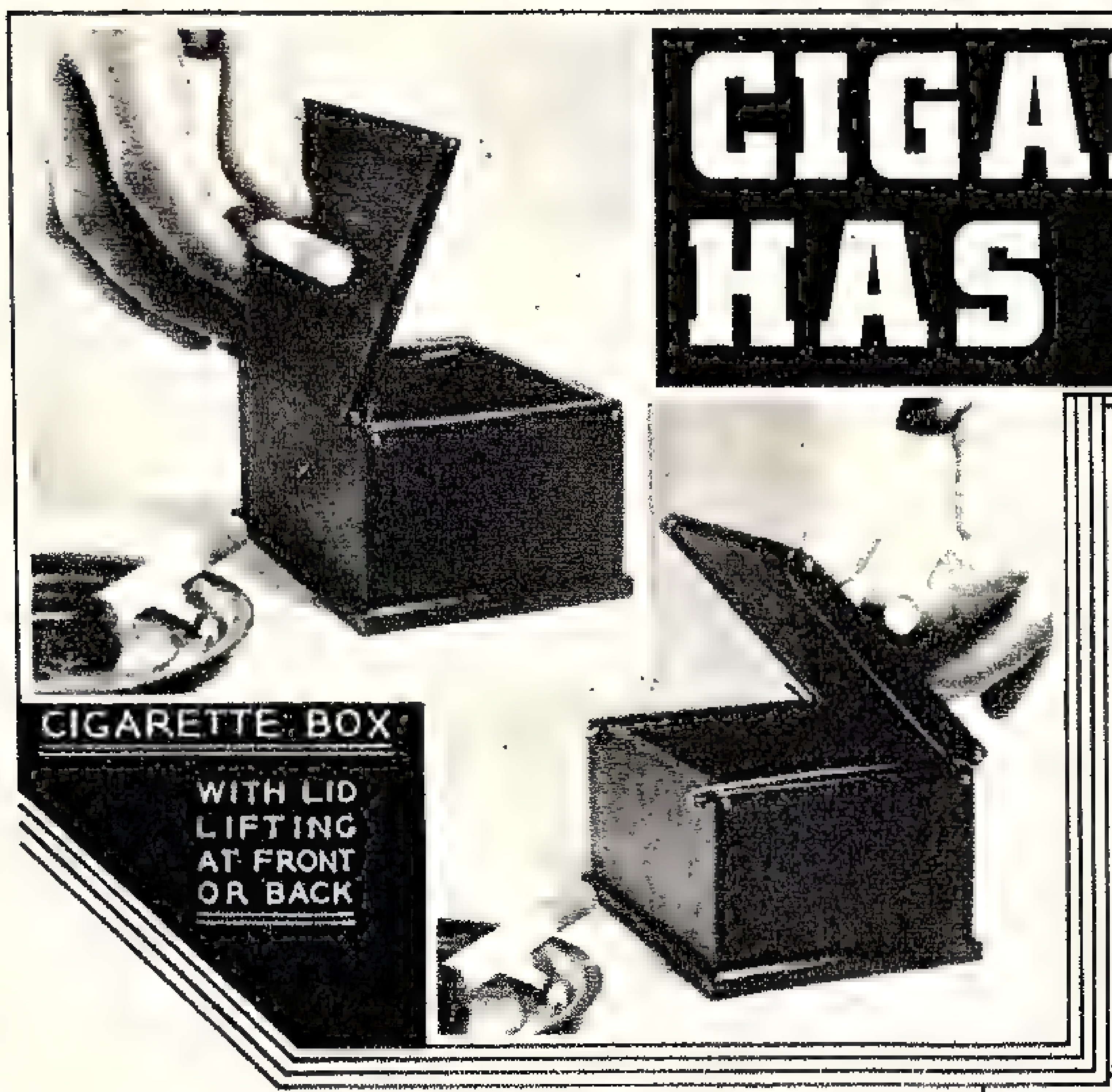
Undoubtedly a fly lights nicer on the water if a taper leader is used. Taper leaders made of silk worm gut are expensive. Synthetic gut, which can be bought in 30-yard coils, is taboo to the chronic fly-caster. It frays—takes on a feather edge—and soon becomes water-soaked. However, satisfactory taper leaders can be made with synthetic gut by following the directions in the accompanying drawings. Three coils of synthetic gut in assorted sizes will make enough taper leaders for several seasons. The simple secret is to treat the gut with airplane dope or celluloid cement. This must be done only when the leader is perfectly dry.

There is an added satisfaction to an angler to outwit game fish with lures of his own

[*Continued on page* 130]

Women, too, find angling a sport packed with thrills. True fishermen don't go out after fish—they go fishing!

CIGARETTE BOX HAS TRICK LID

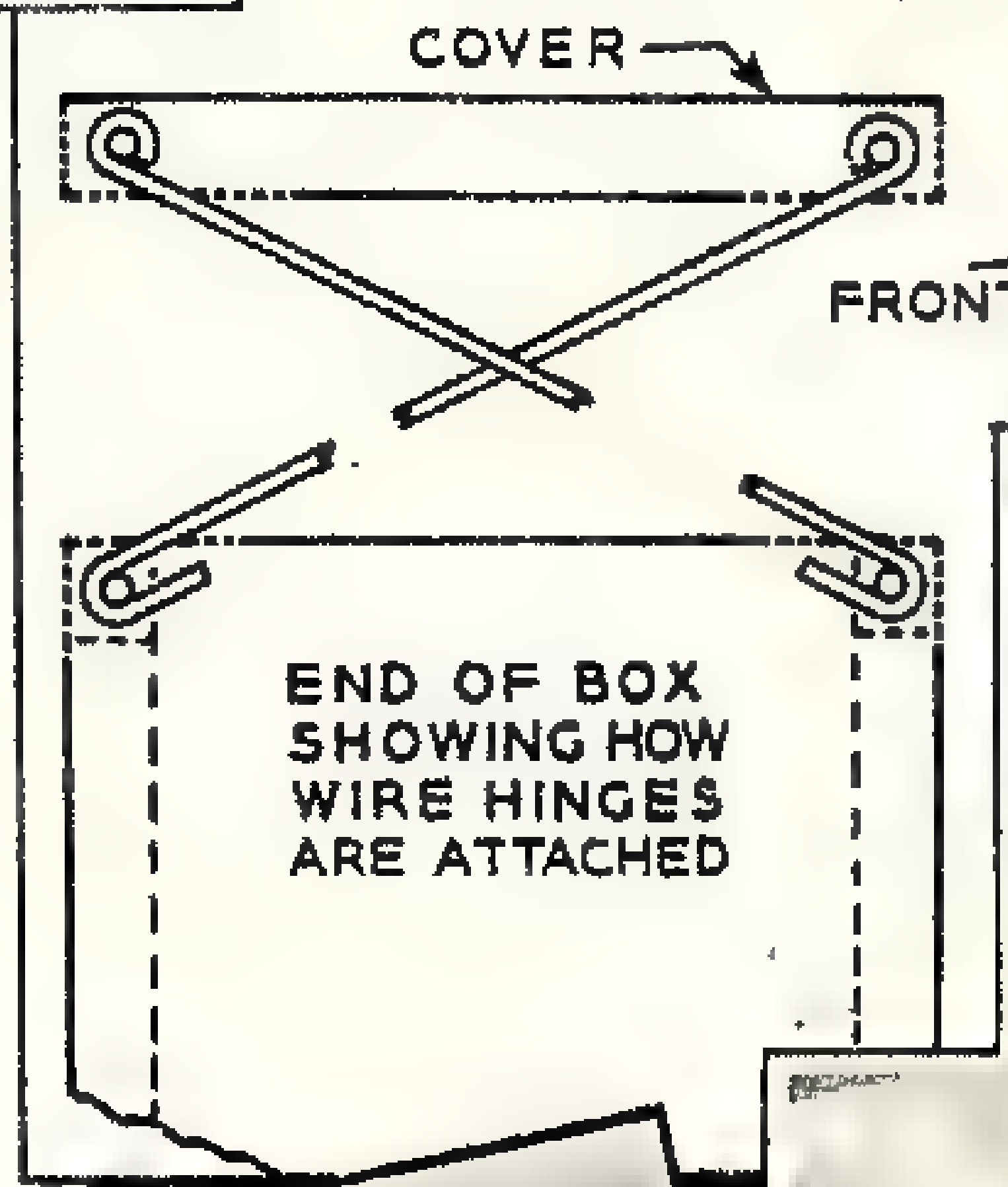

CIGARETTE BOX
WITH LID LIFTING AT FRONT OR BACK

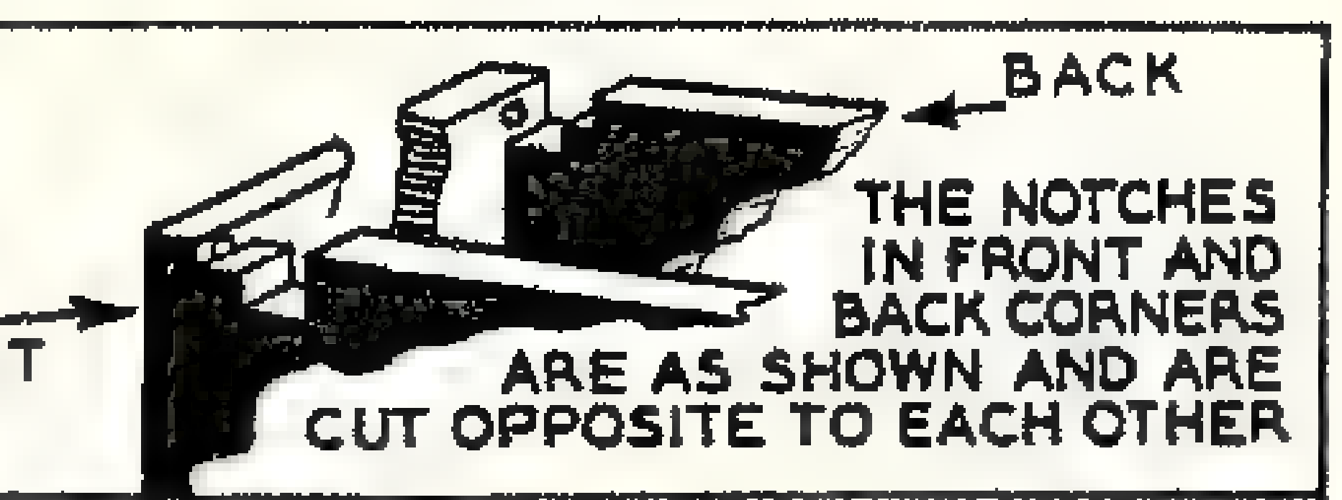
AMONG the different types of containers designed for holding cigarettes, this one has real novelty in addition to practical usefulness. The lid cannot be raised by a direct upward pull, but either side can be opened at will, for the box is constructed with hinges on both sides. Without a close inspection the method of operation is puzzling to the average observer.

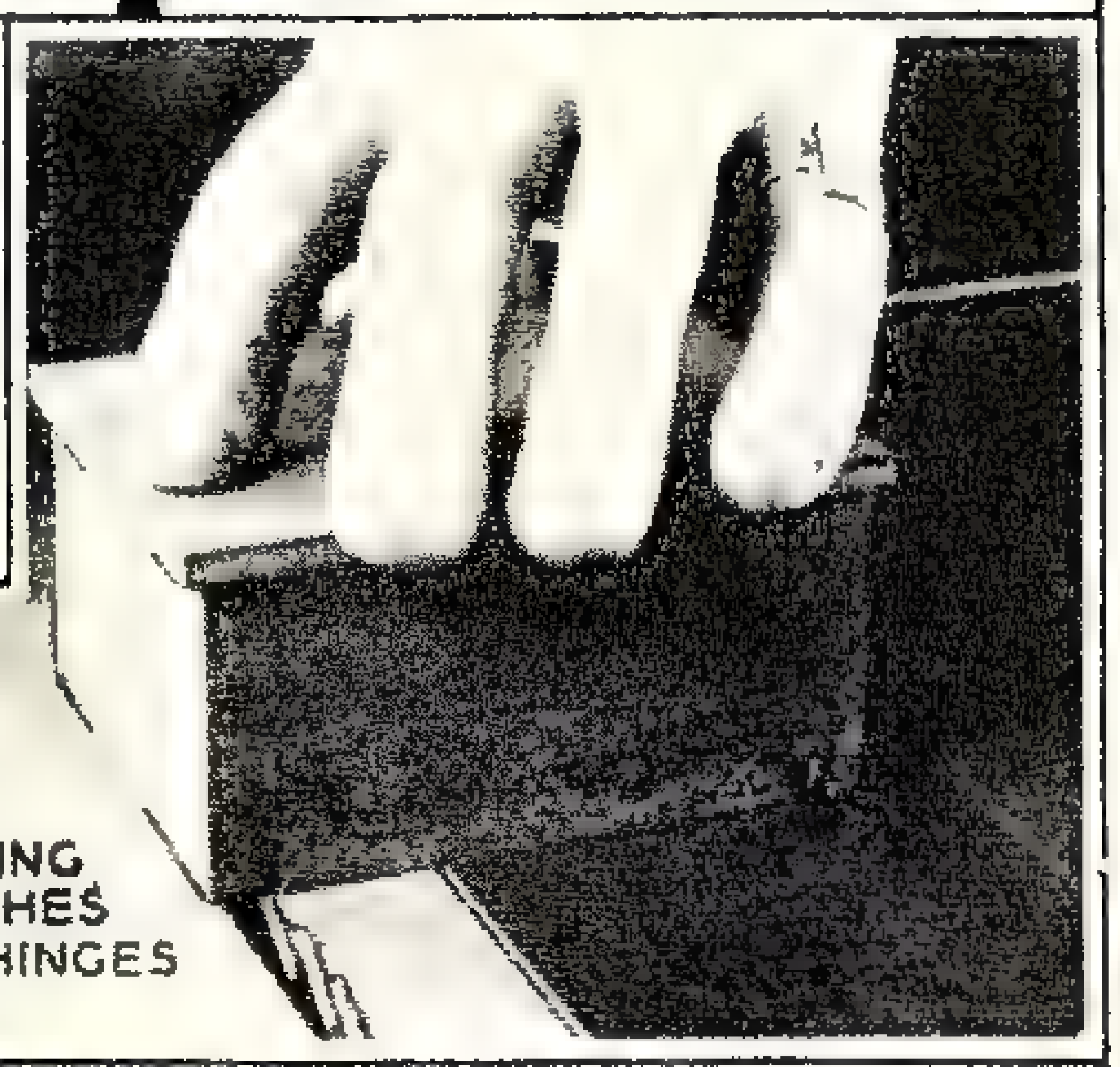
The box in the illustrations was made of ¼-inch "tempered" pressed wood, which is particularly hard, and has inside dimensions of 3¼x2½-inches. A larger box to hold handkerchiefs, jewelry or other articles is as easy to make and the method of attaching the hinges is the same. The latter have nothing in common with usual hinges, but consist of pieces of stiff brass wire with looped ends which are anchored with pins at the four corners of both box and lid. A study of the illustrations will reveal the operating principle.

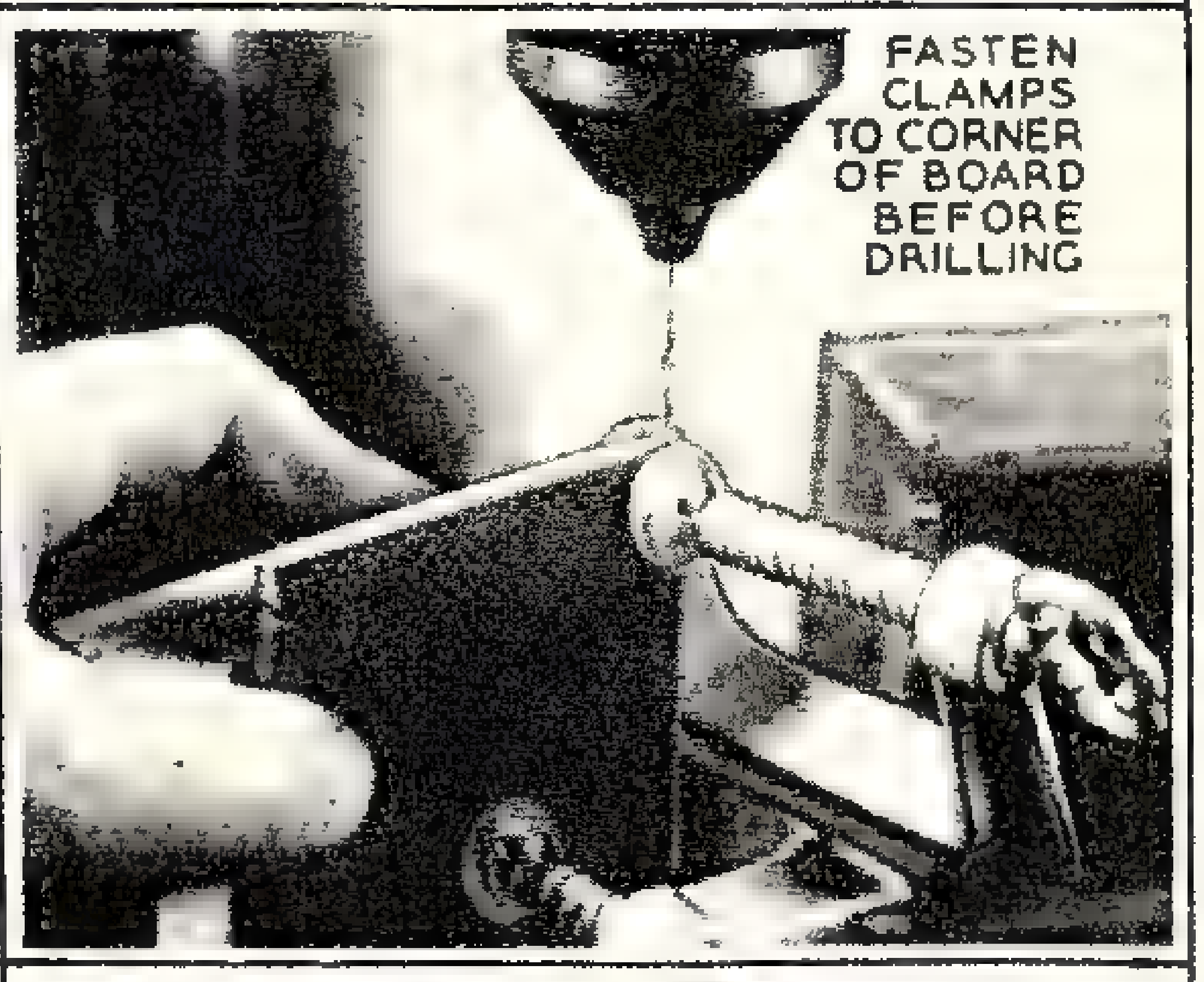
After assembling the box, saw notches at

[*Continued on page* 126]


COVER
END OF BOX SHOWING HOW WIRE HINGES ARE ATTACHED

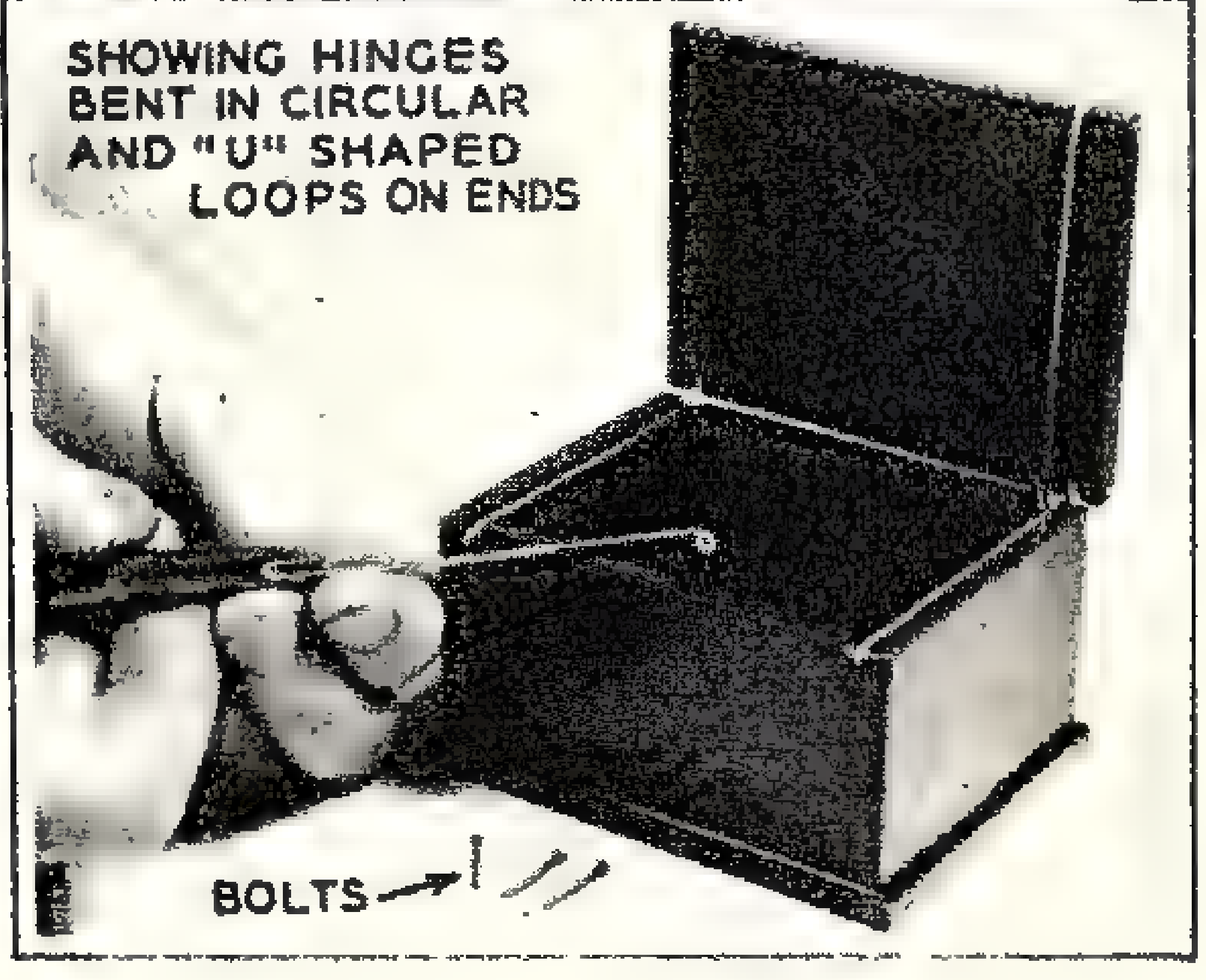

BACK
FRONT
THE NOTCHES IN FRONT AND BACK CORNERS ARE AS SHOWN AND ARE CUT OPPOSITE TO EACH OTHER


CUTTING NOTCHES FOR HINGES

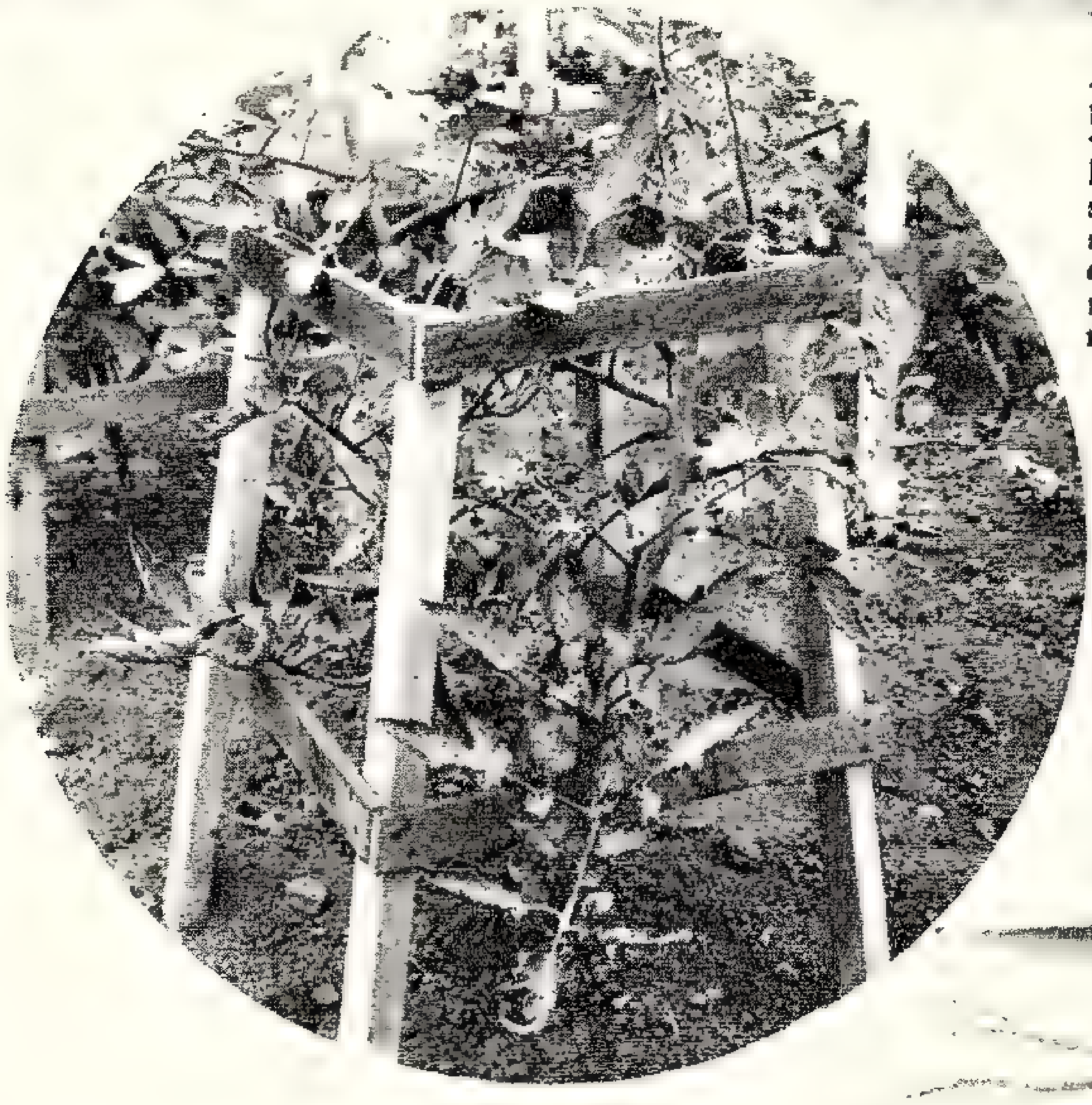

FASTEN CLAMPS TO CORNER OF BOARD BEFORE DRILLING

THE FINISHED BOX

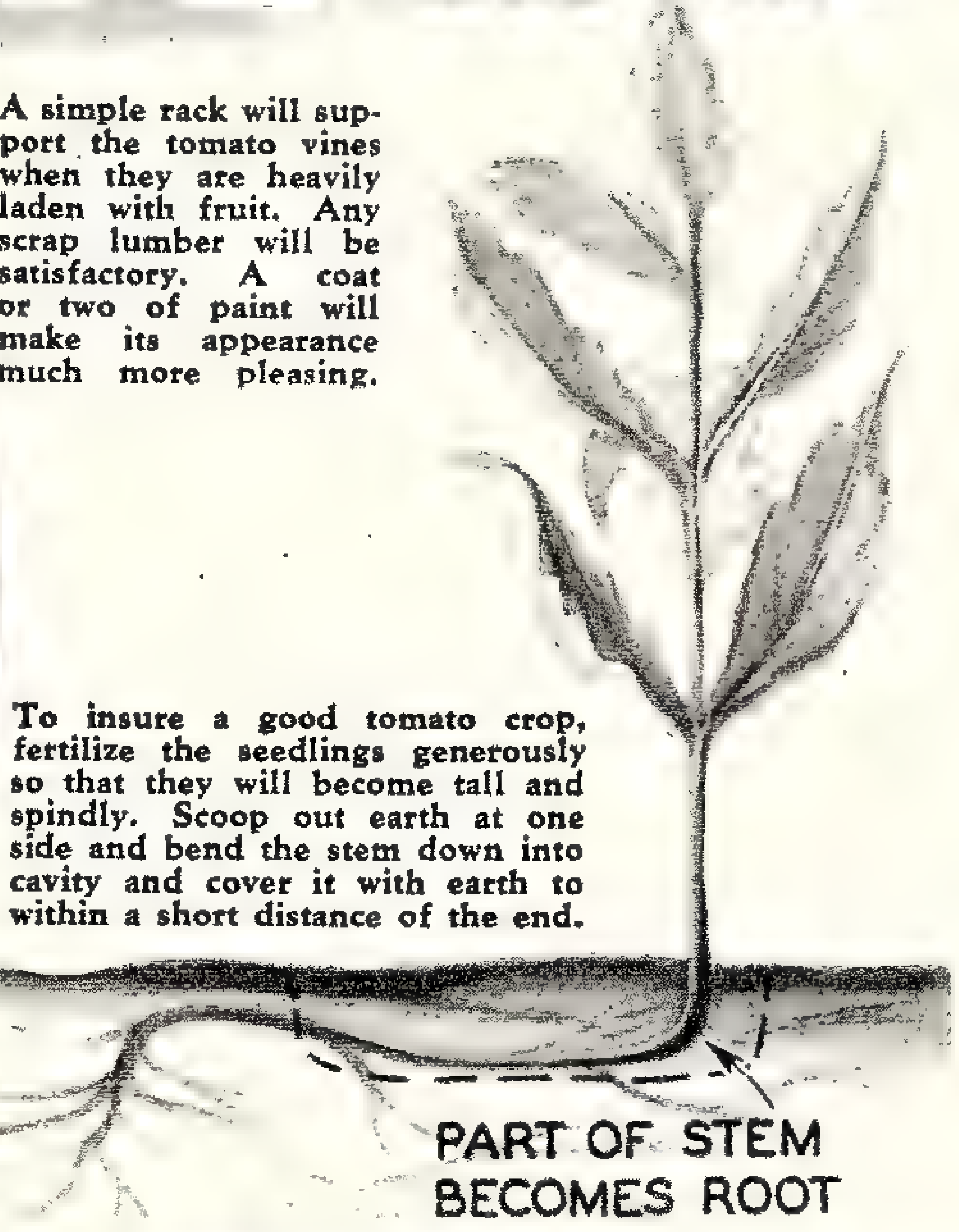
Constructed from a sheet of one-quarter-inch pressed wood, the novel cigarette box shown at the left has a lid that can be opened from either side, but not by a direct upward pull. Any home craftsman can build this simple box after a study of the photographs and sketch, which amply illustrate the construction details explained in the text.


SHOWING HINGES BENT IN CIRCULAR AND "U" SHAPED LOOPS ON ENDS
BOLTS

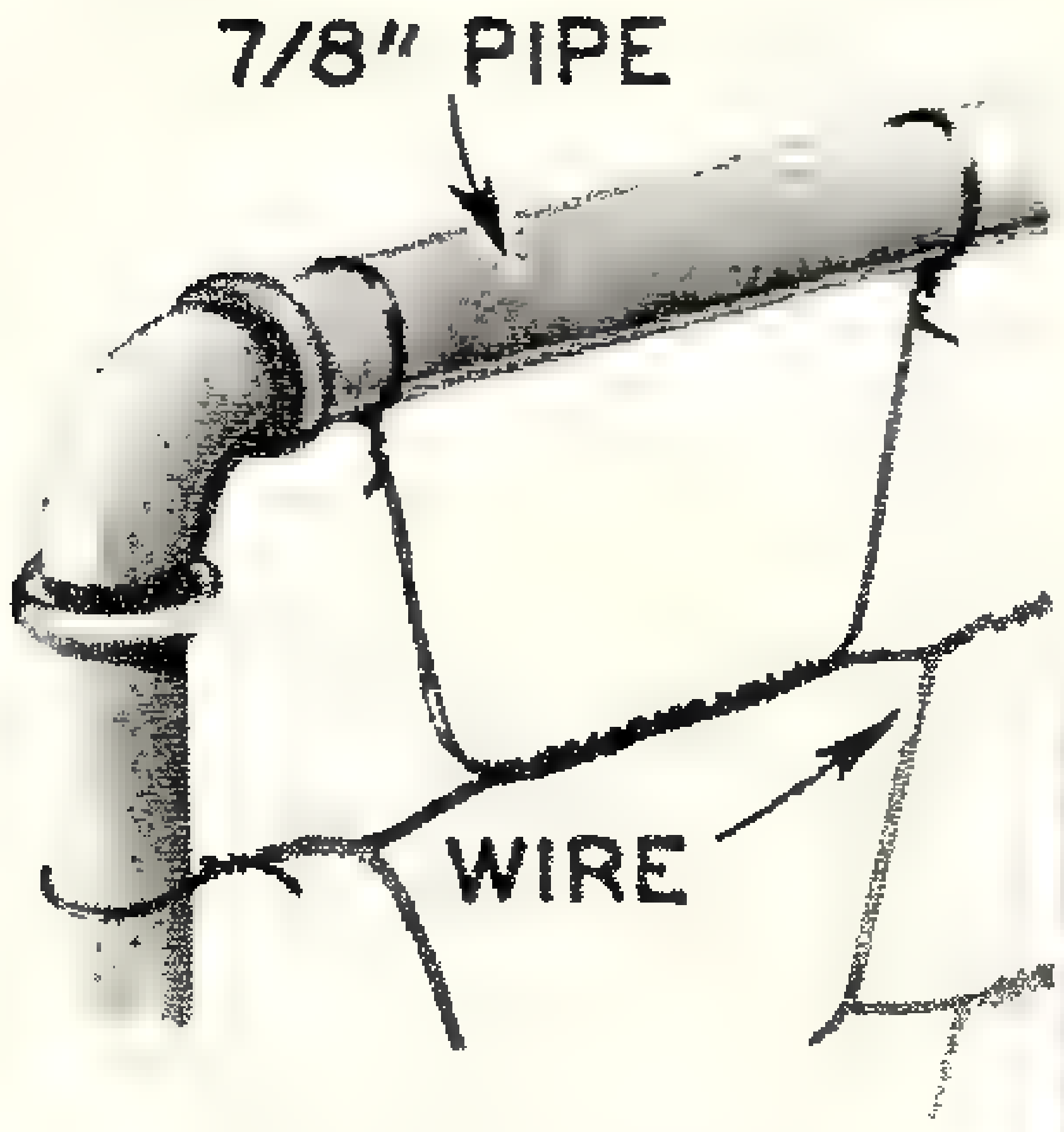
TIPS for the



A simple rack will support the tomato vines when they are heavily laden with fruit. Any scrap lumber will be satisfactory. A coat or two of paint will make its appearance much more pleasing.

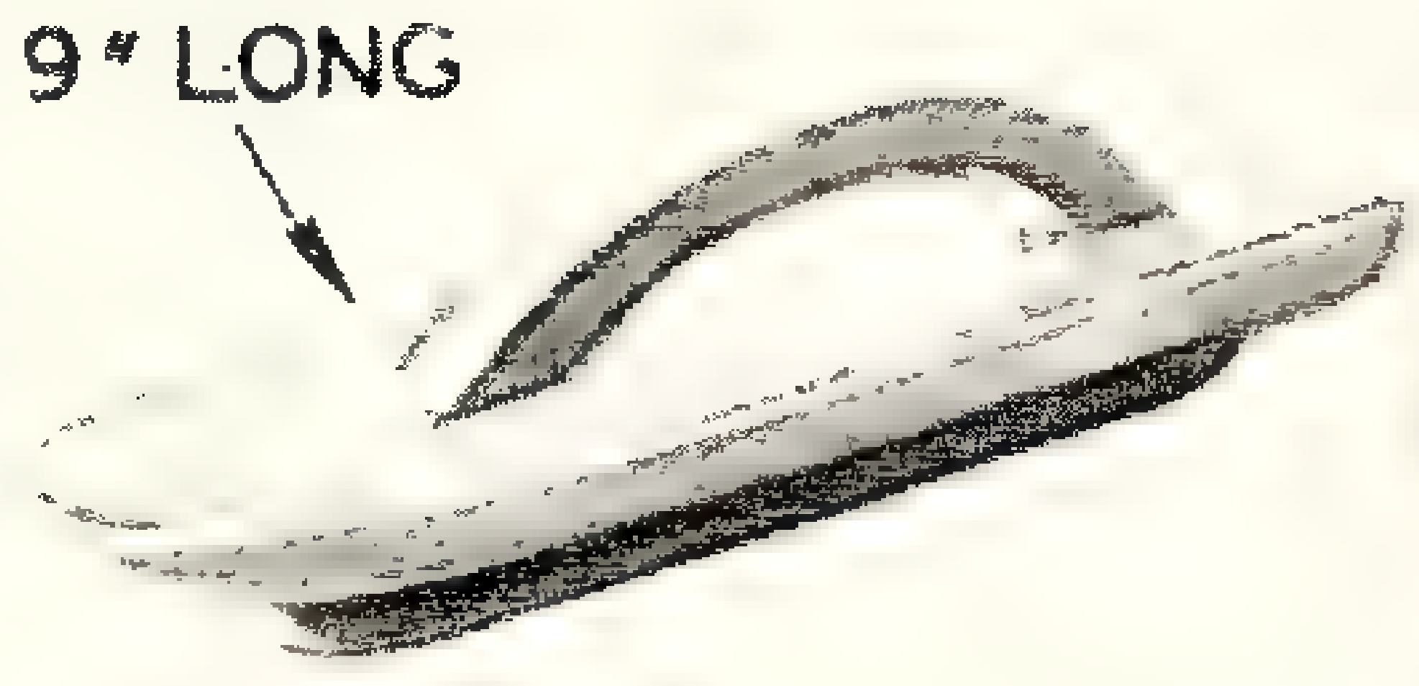


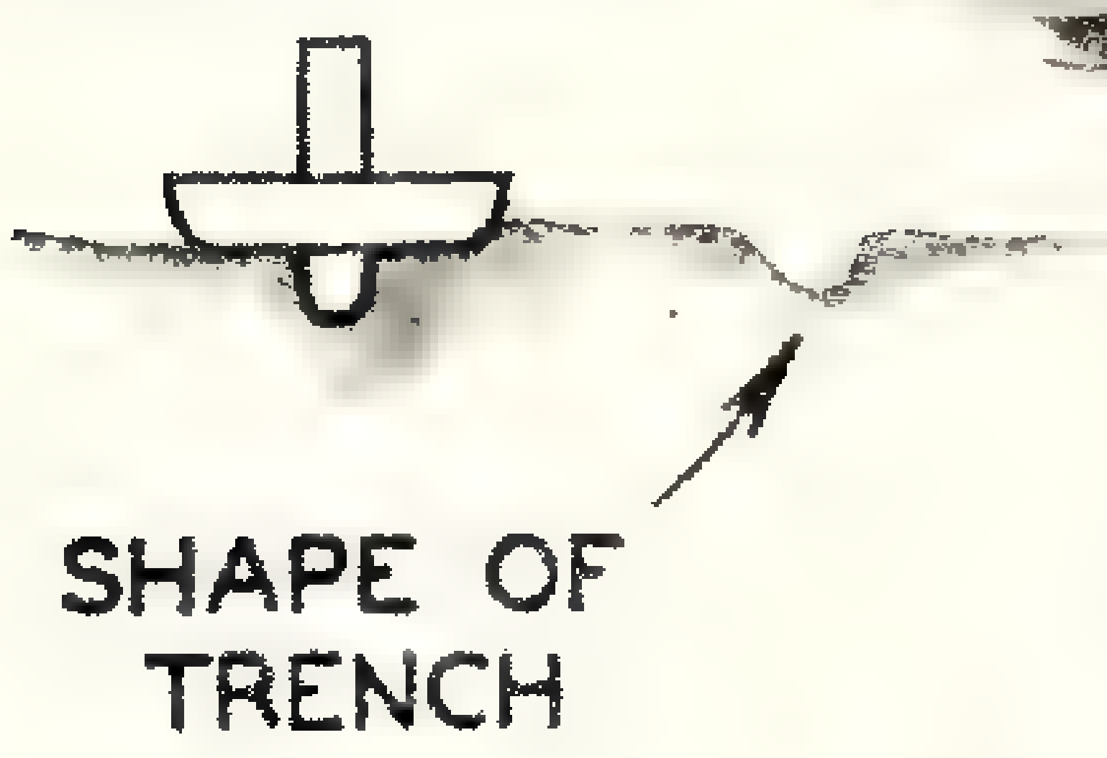
To insure a good tomato crop, fertilize the seedlings generously so that they will become tall and spindly. Scoop out earth at one side and bend the stem down into cavity and cover it with earth to within a short distance of the end.



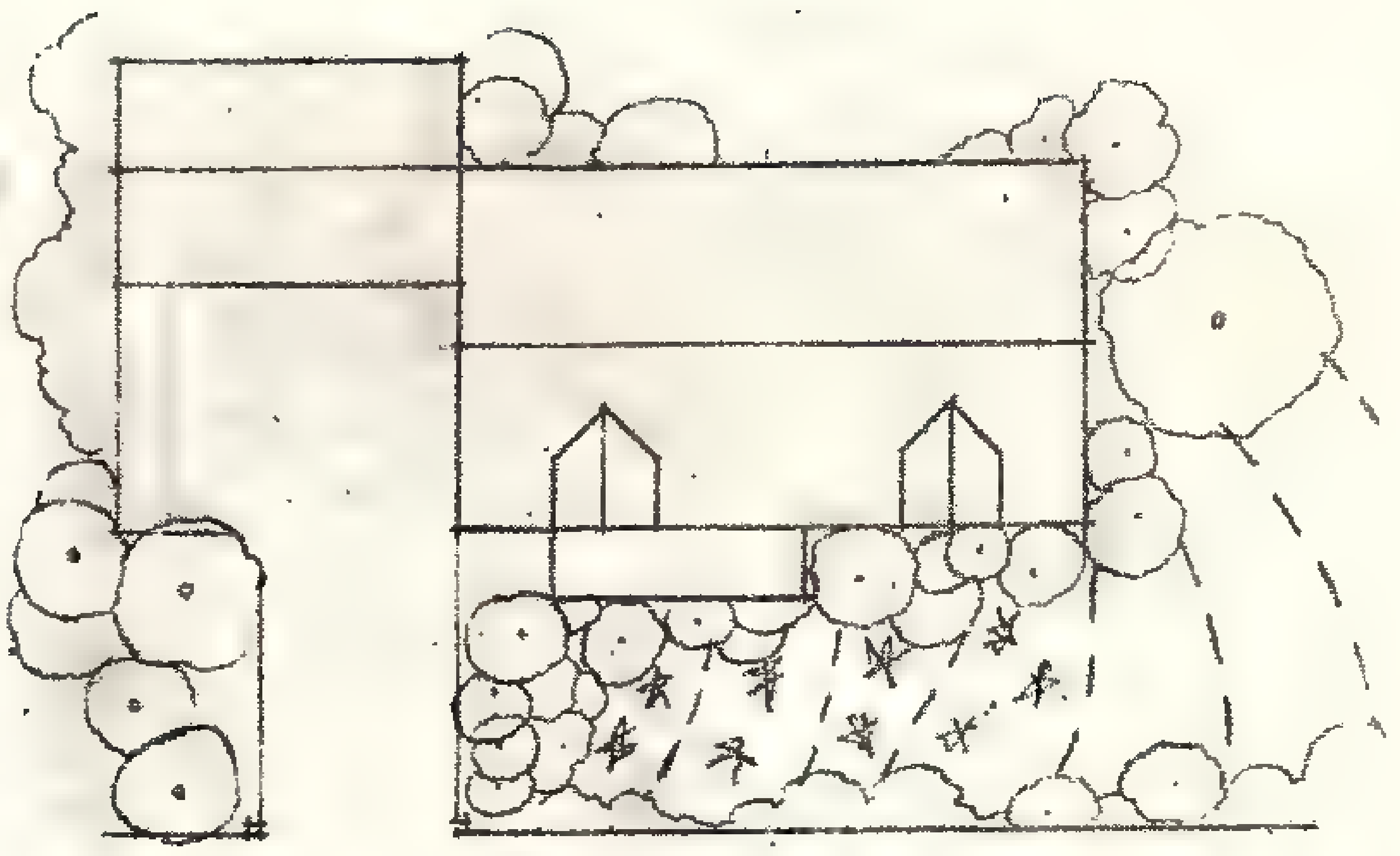
This sweet-pea trellis of galvanized pipe and wire can be pulled up and moved to a new spot each season. When the vines have withered the trellis can be pulled up and stored to make room for any other plants.

This easily constructed wood trencher makes uniform rows when it is pulled along a string stretched along the path to be followed. Dimensions can be varied to meet the individual builder's needs.



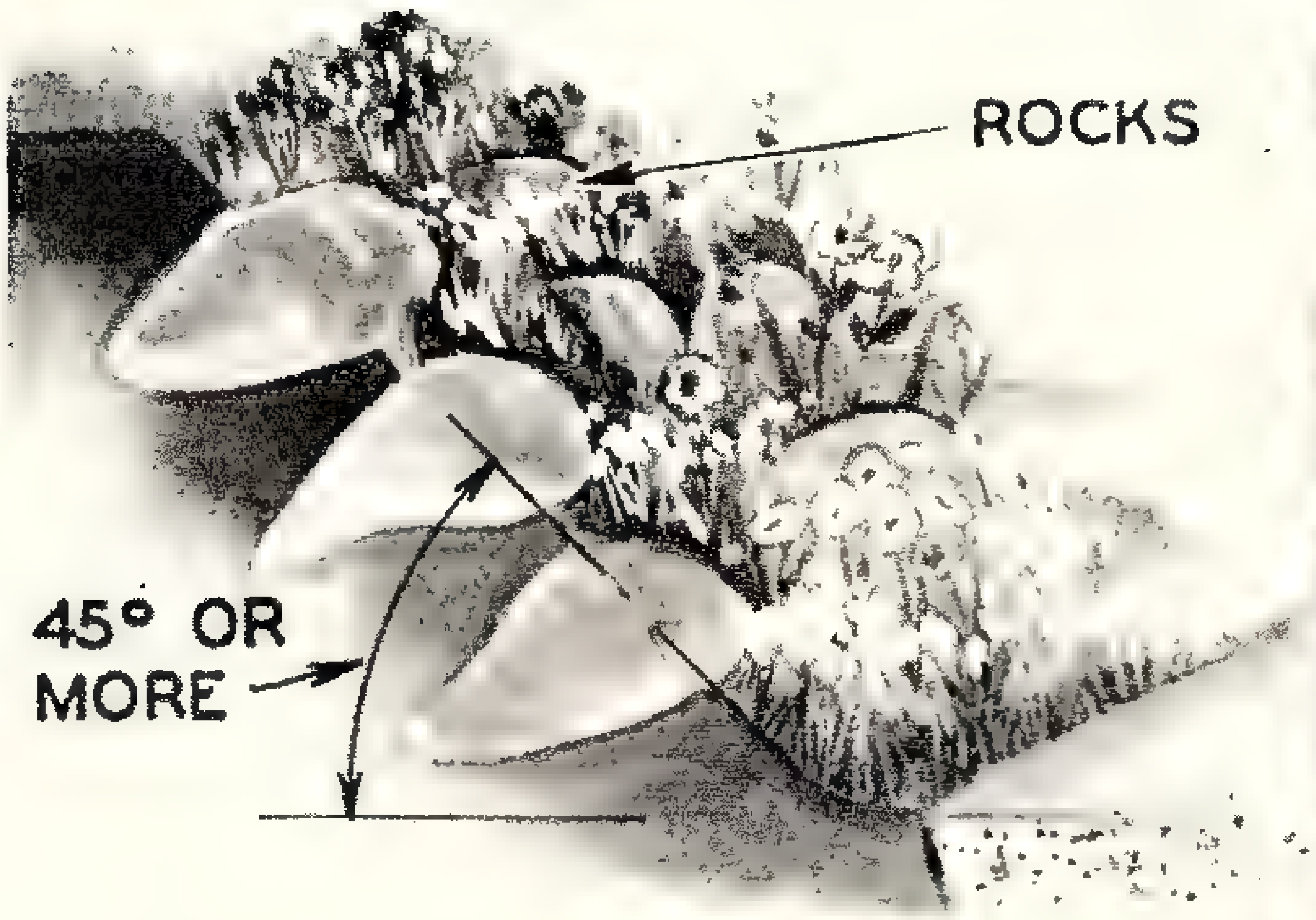


When the task of caring for the lawn becomes tiresome, considerable work can be eliminated by careful planting of annuals. The taller ones should be placed near the house.

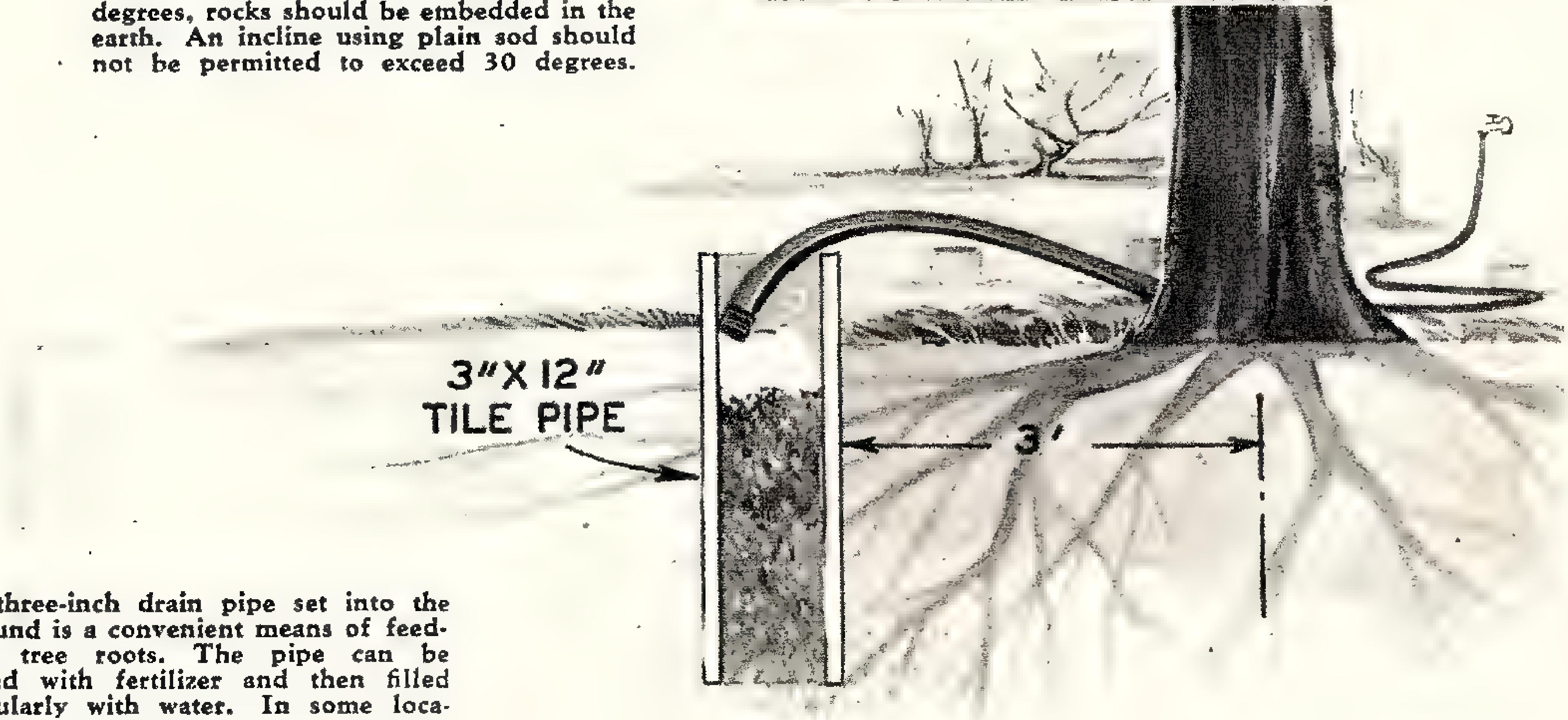


HOME GARDENER

EVERY amateur gardener has been confronted with at least one of the problems solved here, such as the burden of caring for the lawn after the spring enthusiasm fades. An old-fashioned flower garden, once established, does not require exacting care. You may have old trees whose foliage is spindly—feed it vitamins through drain tile, or water through a perforated pipe that reaches the deeper roots. The seed trencher is easy to make, and the sweet-pea trellis a great convenience. Tomato vines produce a surprising crop when started right in youth. And that dried out and trampled terrace can be greatly improved with a rock garden.



When a drain slope is as great as 45 degrees, rocks should be embedded in the earth. An incline using plain sod should not be permitted to exceed 30 degrees.

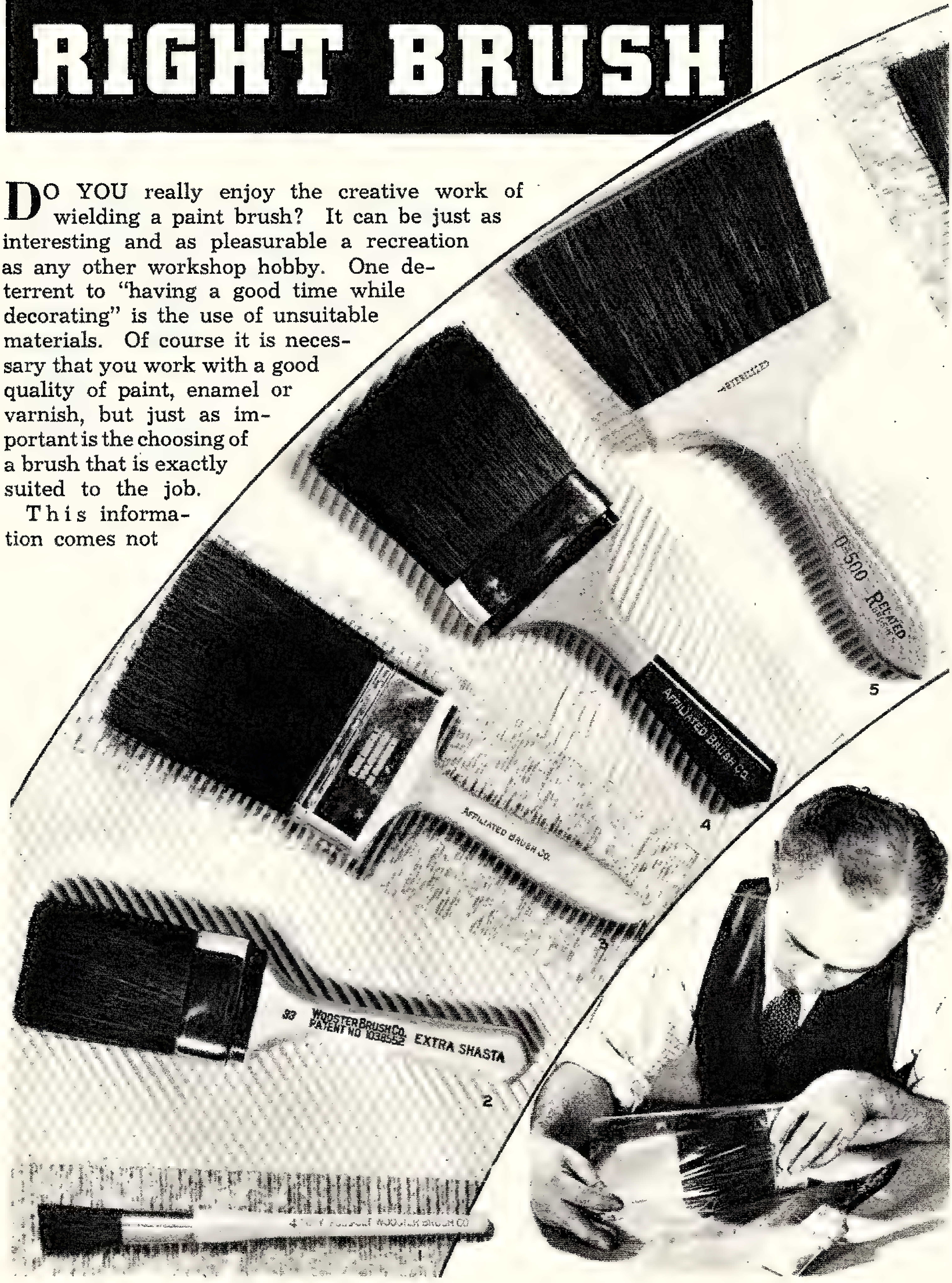


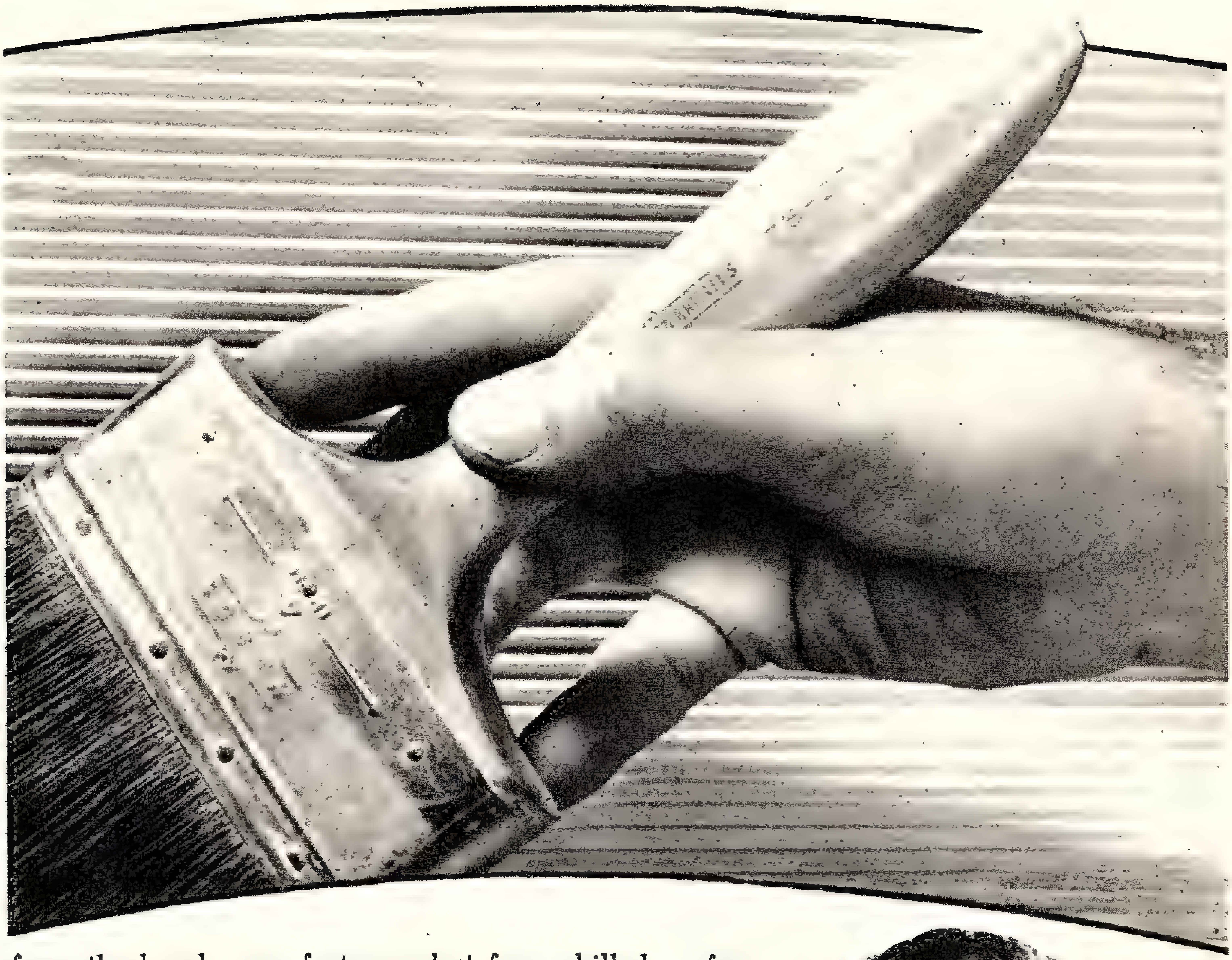
A three-inch drain pipe set into the ground is a convenient means of feeding tree roots. The pipe can be filled with fertilizer and then filled regularly with water. In some locations this is the only way trees can obtain sufficient moisture to exist.

CHOOSE THE RIGHT BRUSH

DO YOU really enjoy the creative work of wielding a paint brush? It can be just as interesting and as pleasurable a recreation as any other workshop hobby. One deterrent to "having a good time while decorating" is the use of unsuitable materials. Of course it is necessary that you work with a good quality of paint, enamel or varnish, but just as important is the choosing of a brush that is exactly suited to the job.

This information comes not

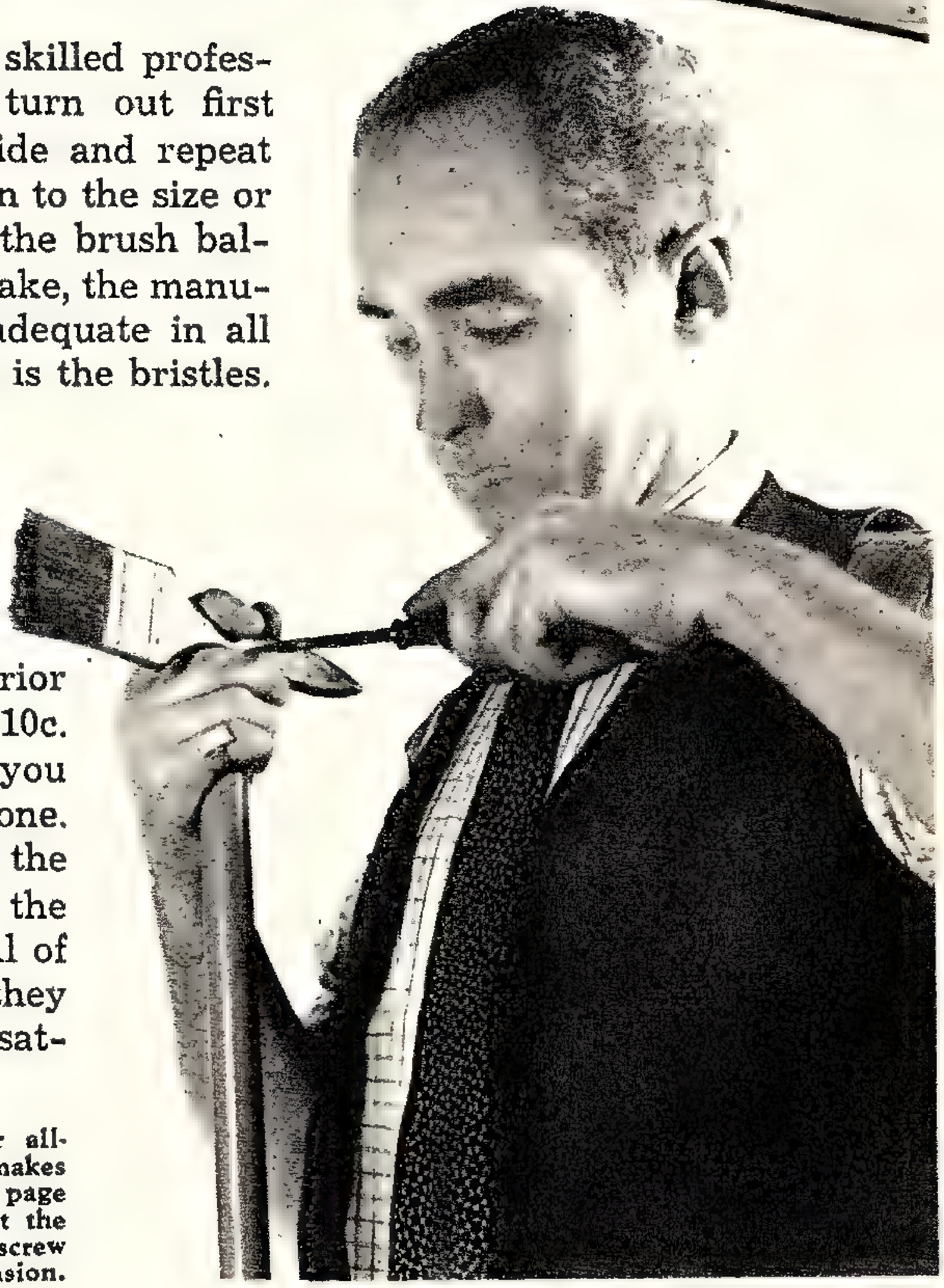

STERILIZED
D-500 RELATED
5
AFFILIATED BRUSH CO.
4
AFFILIATED BRUSH CO.
3
33
WOOSTER BRUSH CO.
PATENT NO 1038552
EXTRA SHASTA
2
WOOSTER BRUSH CO



from the brush manufacturers but from skilled professional decorators, who know how to turn out first class work because it is a matter of pride and repeat business. First, they say, pay no attention to the size or shape or weight of the handle, nor how the brush balances in your hand. If it is of a reliable make, the manufacturer has provided a handle that is adequate in all respects. The important part to examine is the bristles.

You will not find good bristles in cheap brushes. Master decorators consider it a worthwhile investment to pay up to $5.00 (and sometimes three times that amount) for a brush with which to do their best class of work, so it is to be expected that only very inferior work can be done with one purchased for 10c. A good rule is to use as fine a brush as you can afford for the quality of work to be done.

With practically all types of brushes the quality is dependent on two points: first, the bristles should be springy, elastic and full of life. They will not spread paint well if they are coarse and stiff, and are likewise unsat-



Opposite page—Several types of brushes needed for all-around house painting. Left—A sheet of cellophane makes an excellent moisture-proof holder for a brush. Top of page—The correct way to hold a brush. Right—To paint the inside of a narrow space where the hand can not reach, screw an old brush to the end of a broom handle as an extension.

A new brush can be tested for stiffness by pressing it against the back of the hand. The bristles should be springy and full of life.

isfactory if they can be bent in any direction without resistance. Secondly, examine the ends of the bristles by fanning them out between the fingers. If each is well "flagged," or split into two or more smaller branches, they will do good work. The flag ends will enable the brush to hold more paint and will spread it out better.

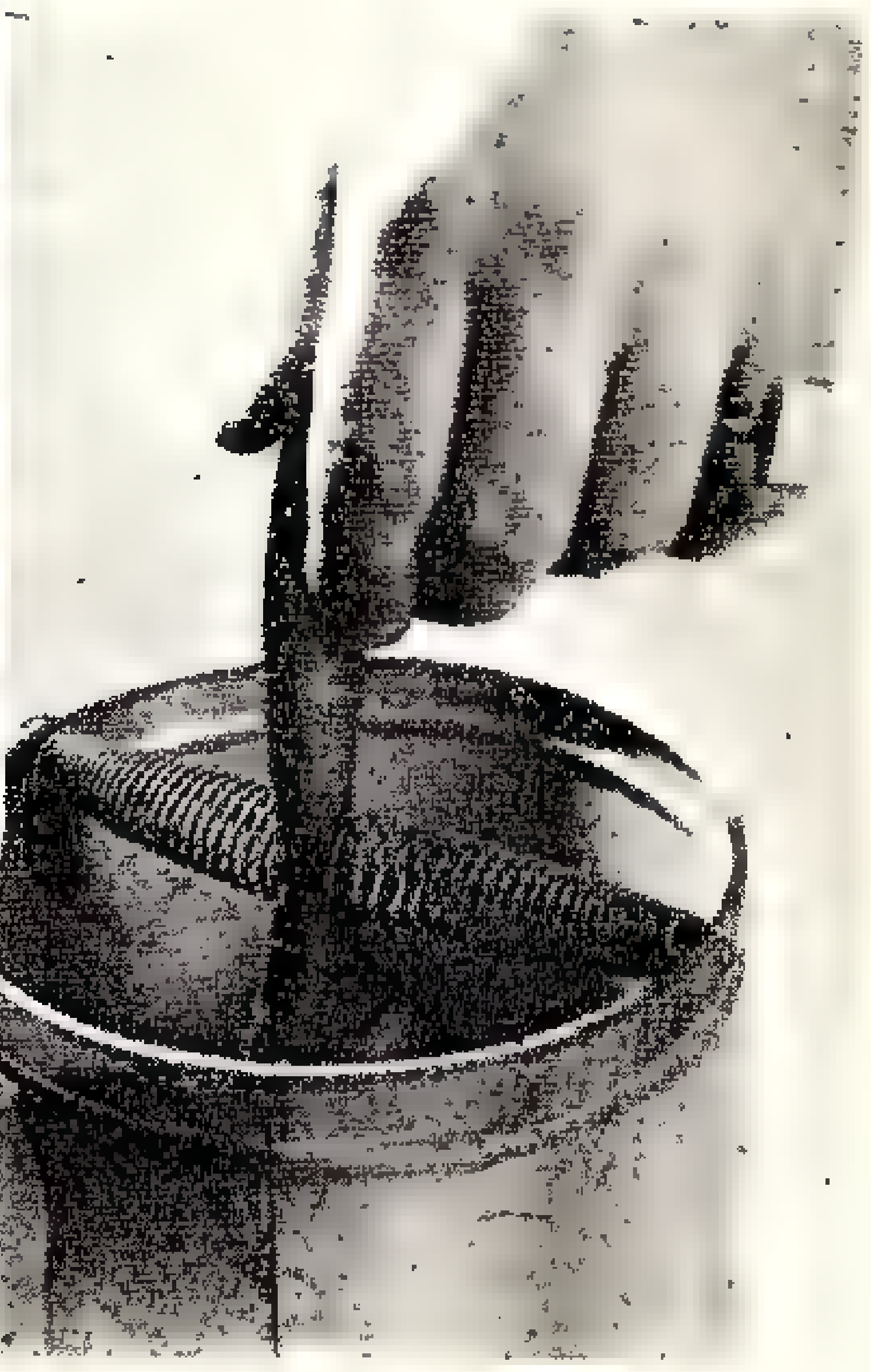
Choose a brush of the correct size and type for the work you wish to do. If you are not sure about the one to use ask the dealer. The bristles should not be too thin or scanty. While a narrow brush is desirable for narrow work, it may leave markings when brushing out the paint on a wide surface. The length of the bristles is important and the longer they are, the better the brush. Then notice whether the bristles are set in glue, rubber or cement.

If the brush is of good quality, either of the three types will be satisfactory for its purpose, but with a cheap brush the setting will allow occasional bristles to loosen throughout its life. A glue-set brush will not be satisfactory if it is to be put in water, while one set with cement should never be used with a finish containing alcohol, such as shellac, or in

Close inspection of brush bristles quickly reveals the presence or lack of "flag ends." Their presence is an indication of quality.

Above—Use a coarse comb to work the cleaner deep into the heel so that every trace of paint is removed. Above right—The result of improper cleaning and care of what was a good brush.

Cleaning a brush immediately after using it will keep it in first class condition for years. Below—A large coil spring will hold the tip of the brush in the paint.



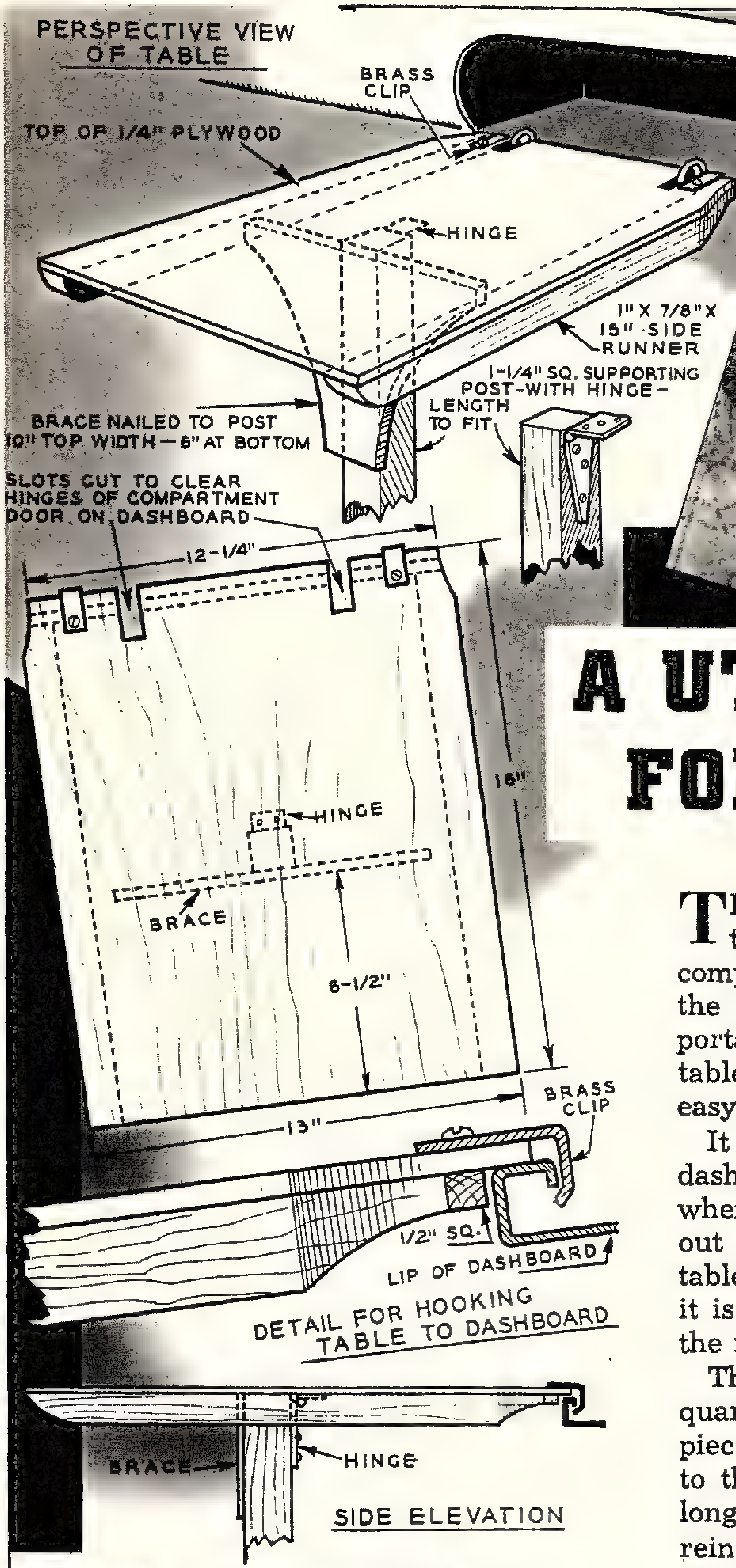
the more volatile solvents such as are contained in quick-drying lacquer and lacquer thinners. The rubber-set brush may be used for all around purposes and will prove most generally suitable. There may be a few loose bristles in the new brush, even of good quality, and it is a good practice to flick them out beforehand by slapping the bristles across your fingers a number of times. If trouble from loose bristles is experienced later, it may be due to lack of care in cleaning and preservation.

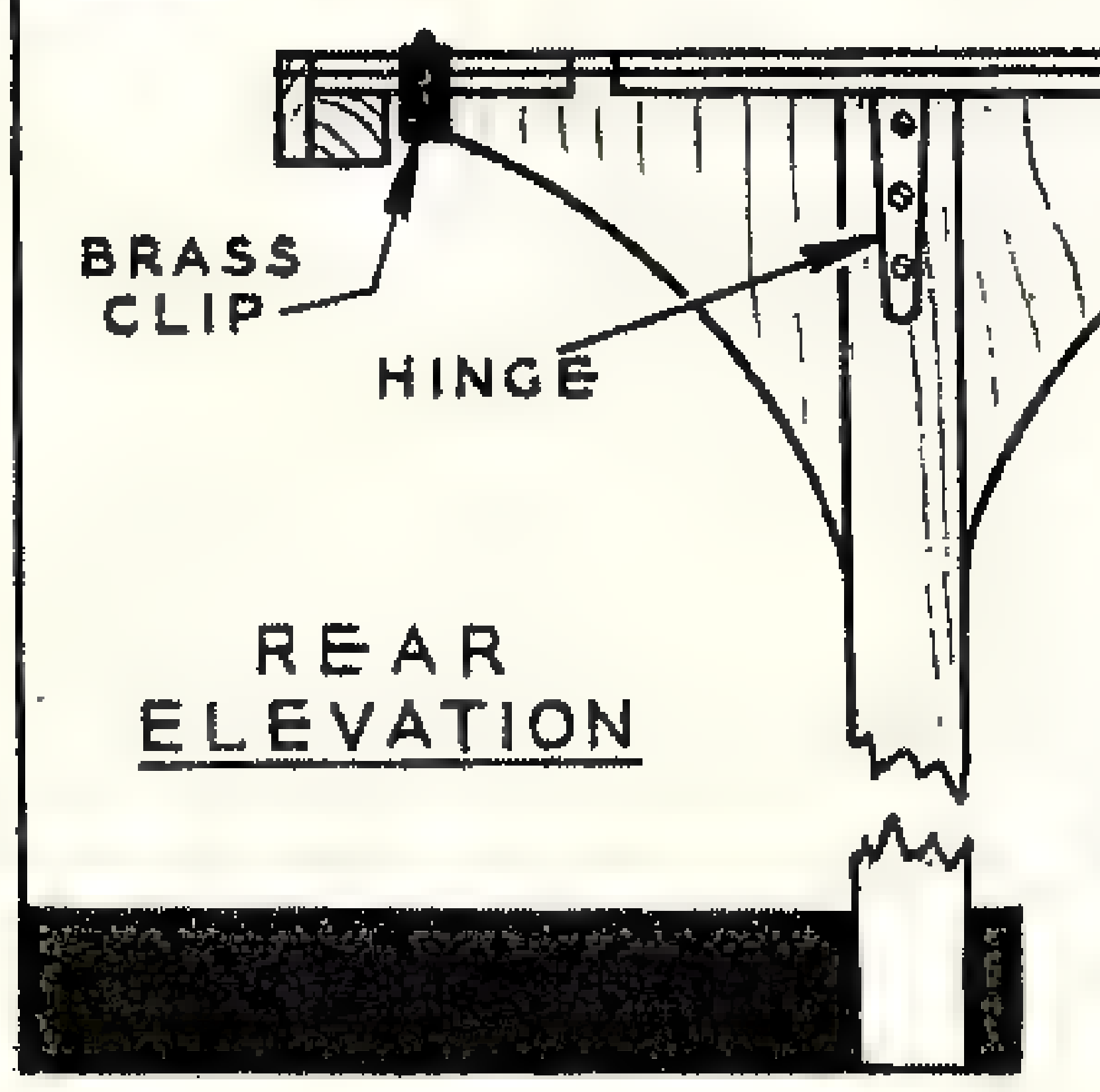
For outside painting jobs most master painters use flat brushes in several widths, with black Chinese bristles set in rubber. For general work you will need one three or four-inches wide, and for sashes and trimming a narrower one with a longer handle (known as a trim brush), either round or oval so that it will carry more paint. With these, as well as with brushes for interior work, you should have a flat duster about four inches wide to clean up the work ahead of the paint brush. While a duster is not absolutely necessary, the quality of your work will be greatly improved.

For enamel and varnish some painters use a good grade of black Chinese bristles, but when questioned they usually admit that for particular work their preference turns to a soft flowing Fitch brush. Bear and ox hair also come in the latter class. While for ordinary painting you will use a square-end brush, varnish and enamels should be flowed on, and for this reason the chisel end is usually chosen. For ordinary work use one about three inches wide, and if possible have on hand smaller brushes for narrow work and trimming. For walls select a four-inch Chinese bristle; floor can be handled nicely with a two and one-half-inch flat or oval, the latter being given the preference. In general, use a brush to suit the size of the surface to be finished, and do not try to use

[*Continued on page* 132]

A UTILITY TABLE FOR THE AUTO


PERSPECTIVE VIEW OF TABLE
BRASS CLIP
TOP OF 1/4" PLYWOOD
HINGE
1" X 7/8" X 15" SIDE RUNNER
1-1/4" SQ. SUPPORTING POST-WITH HINGE-LENGTH TO FIT
BRACE NAILED TO POST 10" TOP WIDTH—6" AT BOTTOM
SLOTS CUT TO CLEAR HINGES OF COMPARTMENT DOOR ON DASHBOARD
12-1/4"
16"
HINGE
BRACE
6-1/2"
13"
BRASS CLIP
1/2" SQ.
LIP OF DASHBOARD
DETAIL FOR HOOKING TABLE TO DASHBOARD
BRACE
HINGE
SIDE ELEVATION


BRASS CLIP
HINGE
BRACE
REAR ELEVATION

Because this table folds compactly out of the way it can be carried in the car at all times and is instantly available when needed. Scrap lumber and one hinge are all that is needed for its construction. If made as described, it is very rigid.

THIS folding table is ready for use at any time and when not needed can be folded compactly and kept in the trunk or under the seat. Although designed for holding a portable typewriter, it can be used as a picnic table, or to prop up a book or magazine for easy reading.

It hooks in the glove compartment of the dashboard on almost any popular priced car when the compartment door is dropped down out of the way and the real weight of the table and anything that may be placed upon it is carried by a verticle post that rests on the floor of the car.

The table top is made of a piece of one-quarter-inch plywood, 13″ by 16″. Two pieces of ⅞″ by 1″ wood, 15″ long are nailed to the under side of the top, flush with the long sides of the top. The ends of these two reinforcing strips are flush with the front edge of the table. On the under side of the top and across the ends of the reinforcing pieces, at the back of the table, is nailed a piece of ½″ square wood, extending from one side to the other. When the table is complete this will prevent it from sliding too far into the dashboard compartment opening.

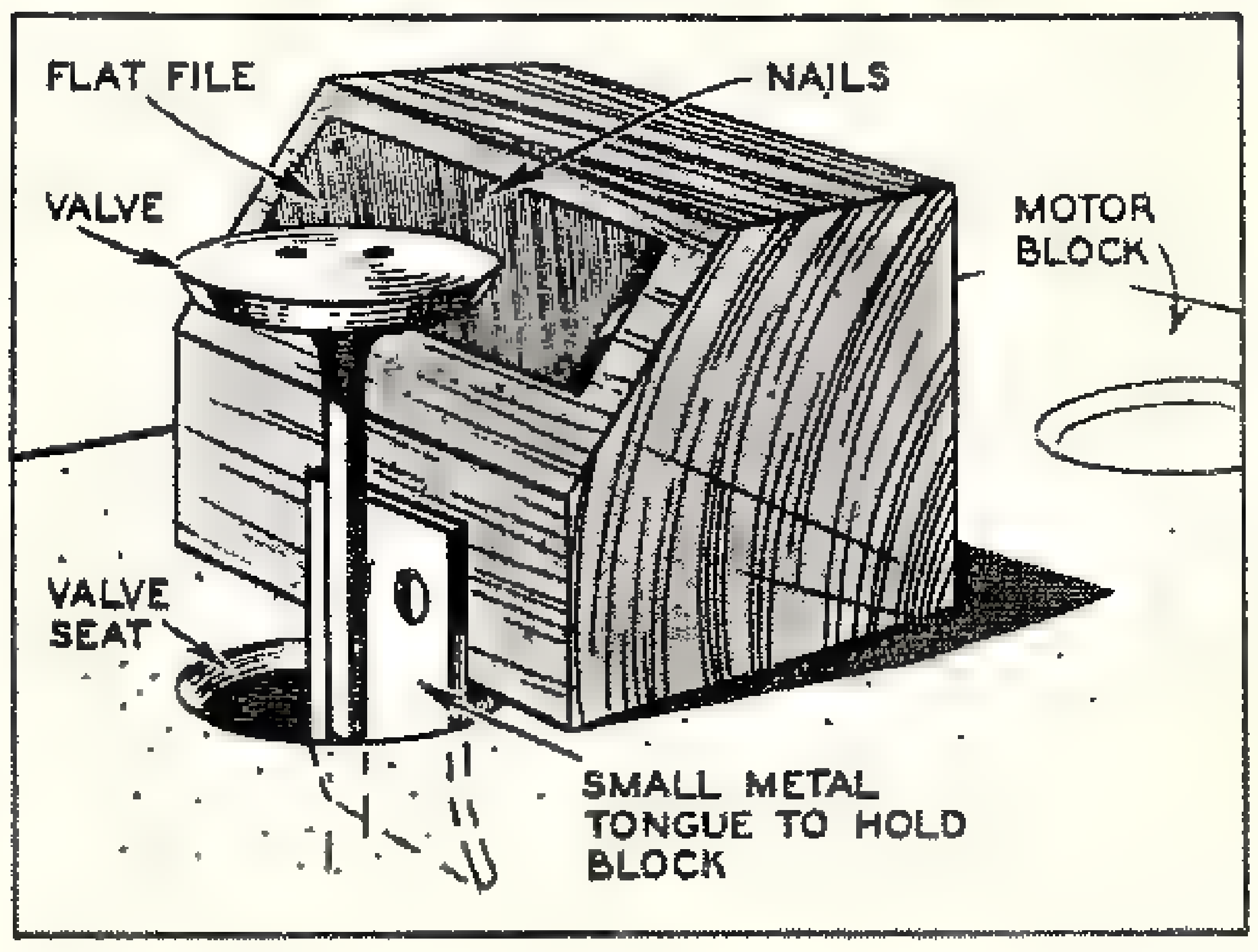
Different types of hinges are used on these compartment doors, depending upon the make of car. Whatever the type, some provision must be made for the table to hook into

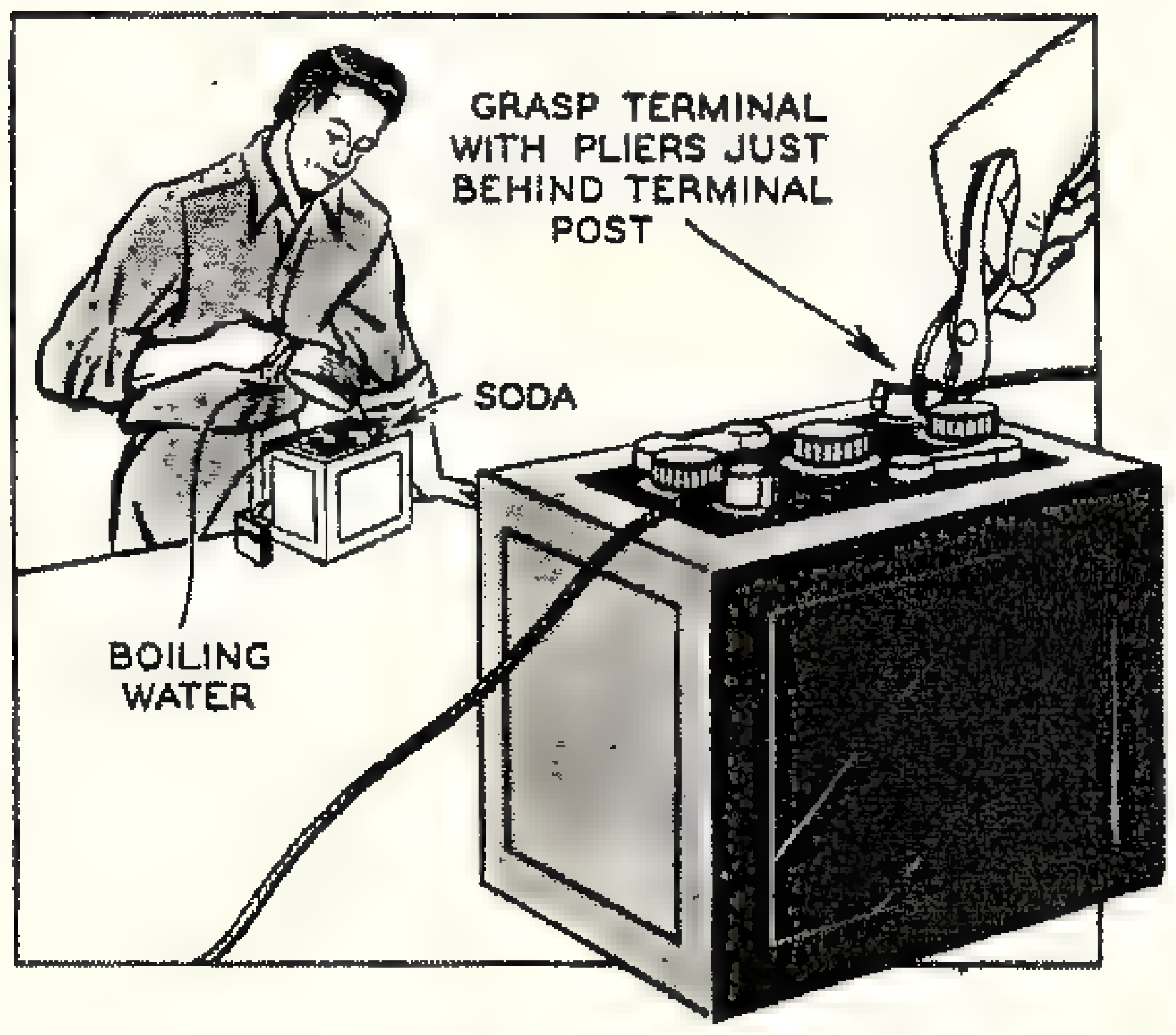
[*Continued on page* 128]

Short Cuts For The Motorist

File Refaces Pitted Auto Valves

WORN or pitted valves can be refaced easily and quickly by the method shown at the right, when the usual refacing machine is not available. The only tools necessary are a medium-fine file and a valve grinding tool. To use the device, place the valve and file block in the position shown, insert the valve grinding tool in the valve head and give the valve twenty or thirty turns, or until a smooth face is obtained. Then remove the block and grind valve with grinding paste.—K. F. Keith.


FLAT FILE
NAILS
VALVE
MOTOR BLOCK
VALVE SEAT
SMALL METAL TONGUE TO HOLD BLOCK

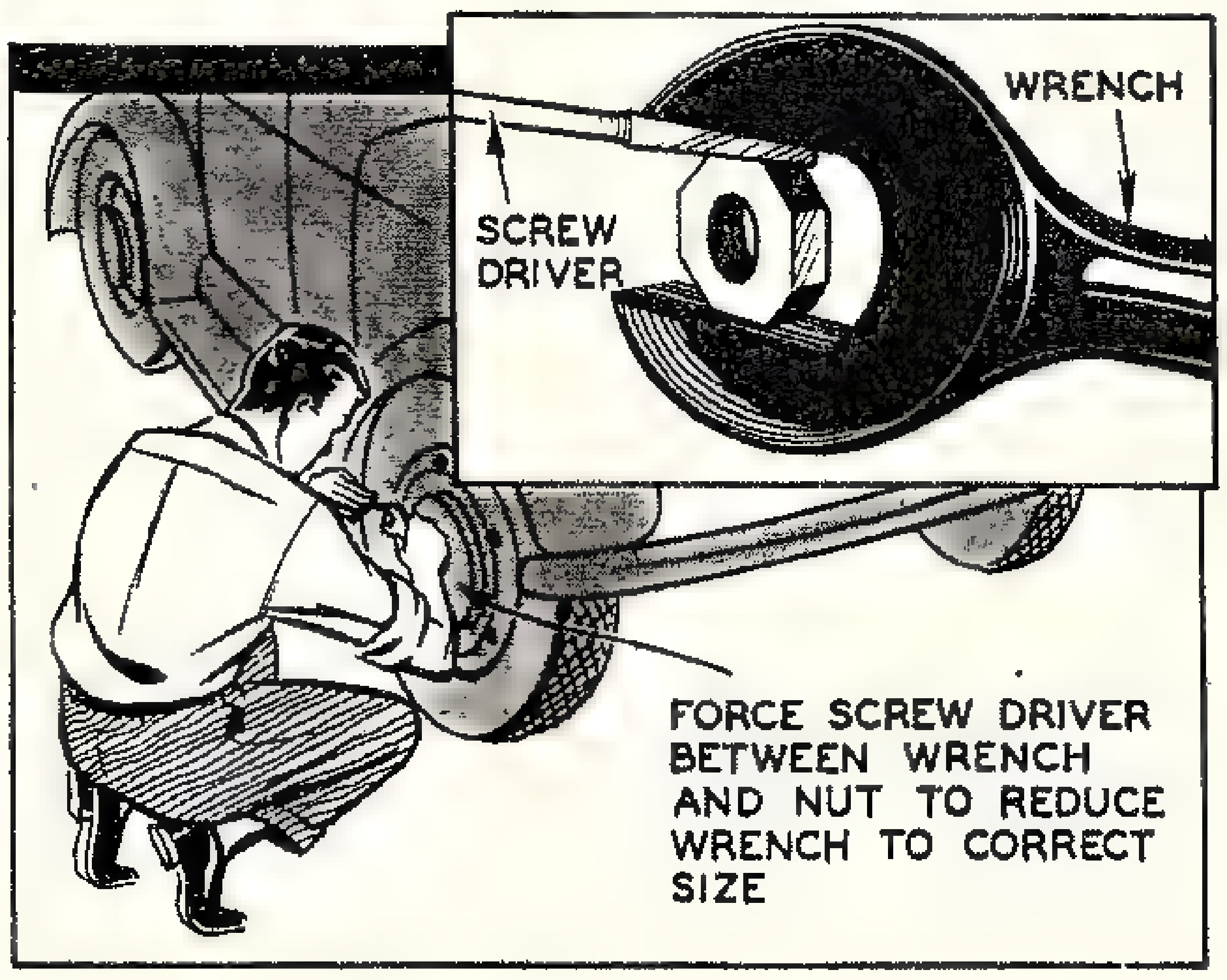

GRASP TERMINAL WITH PLIERS JUST BEHIND TERMINAL POST
SODA
BOILING WATER

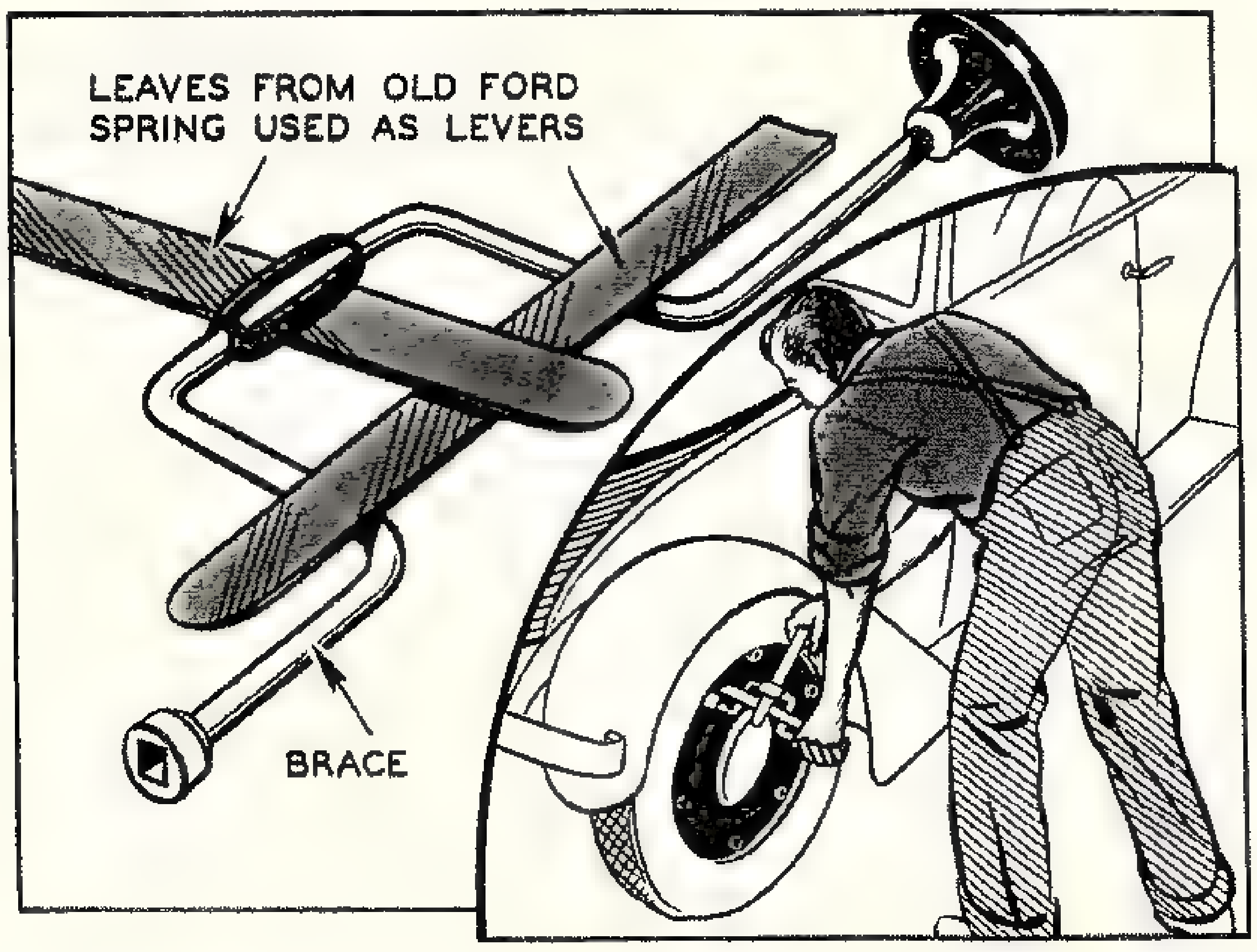
Baking Soda Simplifies Nut Removal

CORROSION often holds the battery connector so tightly to the terminal that damage may result if it is forced off. The connector usually can be removed easily and safely by placing about a teaspoonful of bicarbonate of soda on the terminal and then pouring on sufficient hot water to dissolve the soda. Leave the solution on and around the terminal for about a minute and the corrosion will be softened. The terminal then can be removed without trouble. Be sure that none of the soda solution gets into the battery acid.—G. V. Dwyer.

Screw Driver Aids Spanner Use

MANY times when a special nut is to be turned, the correct size spanner wrench is not available, the wrench being either too large or too small. When confronted with this problem, a screw driver or another spanner will be useful. The screw driver can be inserted between the nut and the over-size wrench. Hold the spanner in one hand and the screw driver in the other, and force both together and exert pressure on the nut at the same time. The flat back or handle of another spanner may be found to fit the gap perfectly.—G. V. D.

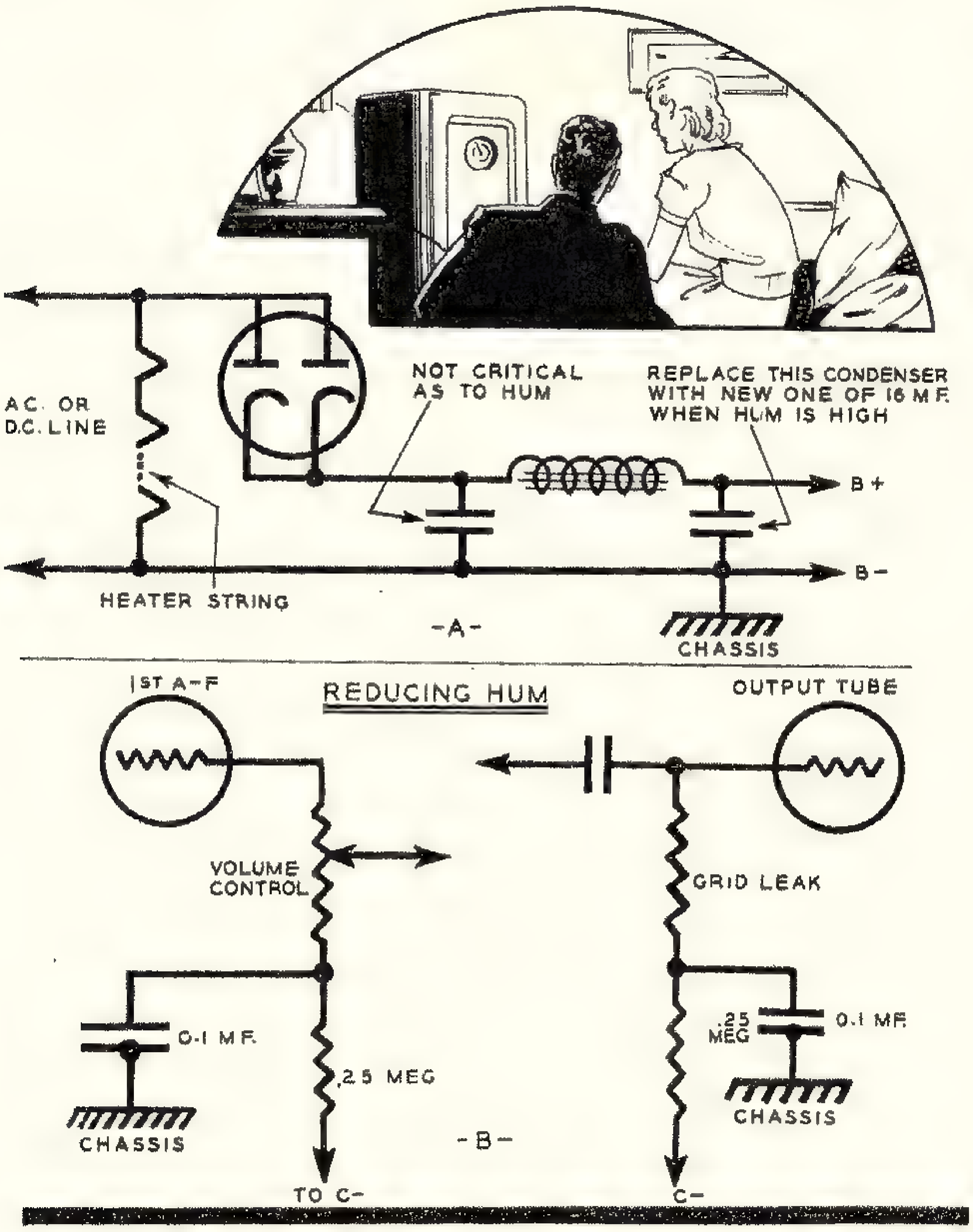

WRENCH
SCREW DRIVER
FORCE SCREW DRIVER BETWEEN WRENCH AND NUT TO REDUCE WRENCH TO CORRECT SIZE


LEAVES FROM OLD FORD SPRING USED AS LEVERS
BRACE

Spring Leaves Loosen Bolts

WHEN wheels have not been removed for a long time, occasionally the nuts will be found to be so tightly fastened to their bolts that the usual brace carried in the car for removing them does not have sufficient leverage to do so. When this is the case, two leaves from an old spring placed in the position shown in the drawing will eliminate the difficulty. The additional leverage obtained in this way will be found sufficient, in most cases, to loosen the most stubborn nuts, even those held in place by rust—G. V. D.

How To Reduce The Hum In Radio Receivers


A.C. OR D.C. LINE
NOT CRITICAL AS TO HUM
REPLACE THIS CONDENSER WITH NEW ONE OF 16 M.F. WHEN HUM IS HIGH
B+
B−
HEATER STRING
-A-
CHASSIS
1ST A-F
REDUCING HUM
OUTPUT TUBE
VOLUME CONTROL
GRID LEAK
0.1 M.F.
.25 MEG
.25 MEG
0.1 MF.
CHASSIS
CHASSIS
-B-
TO C−
C−

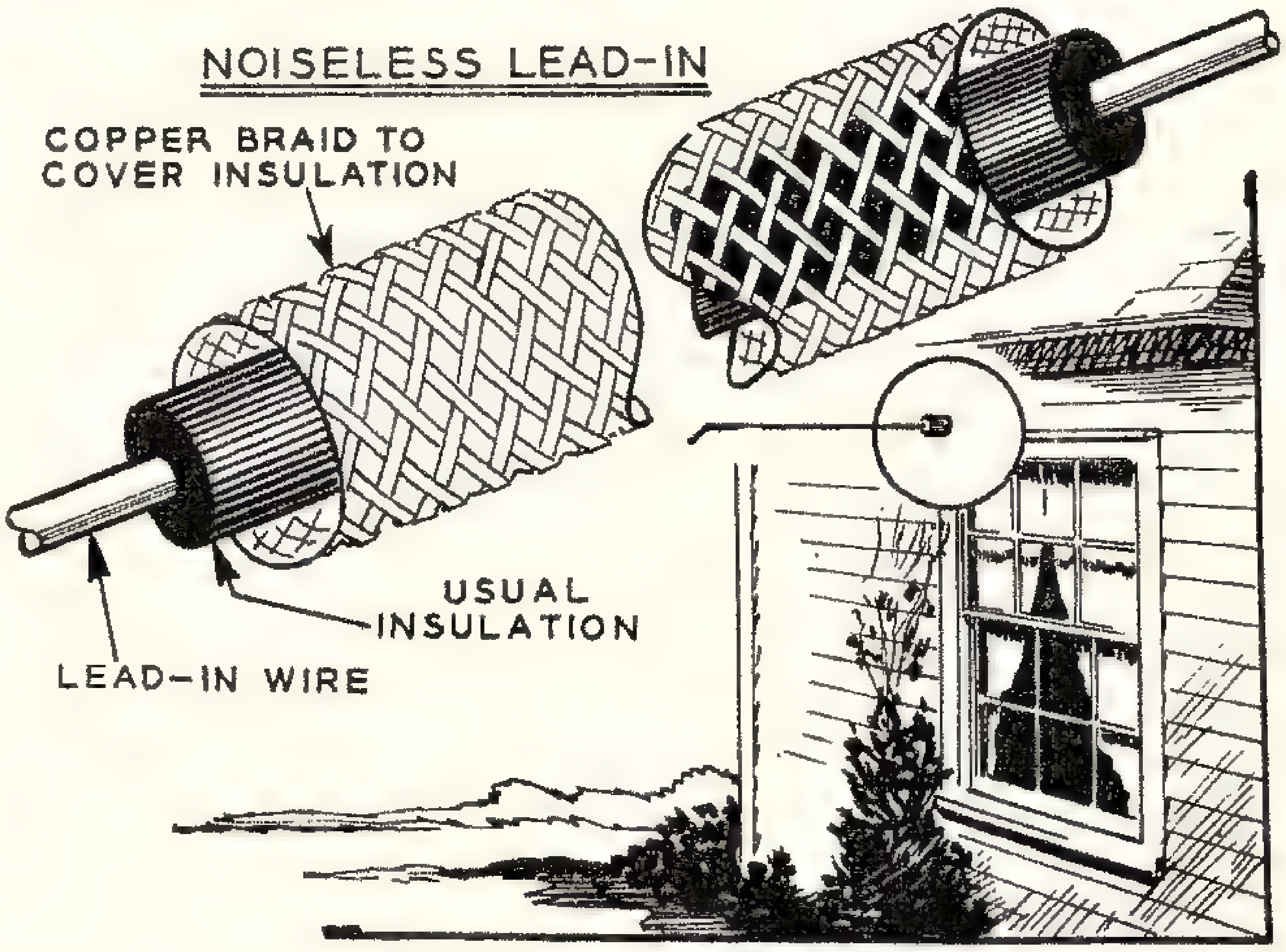
NEARLY all the hum in radio receivers is traceable to the audio amplifier. The hum problem is acute at present, because it costs more money to reduce it to a satisfactory level than most set manufacturers are willing to spend. The critical listener, on the other hand, is willing to spend a dollar or two if he can reduce hum. The following suggestions have been found to be very effective in many cases.

In ac-dc sets, hum increases with time in many cases because the second filter condenser ages. The remedy here is to replace this condenser even though volume and sensitivity appear normal; the usual connection of this condenser is shown at A of the attached sketch.

It is well to insert grid filters to reduce hum, regardless of the type of set. The connection of a grid filter is shown in B of the attached sketch. Locate the grid terminal of the first a.f. or output

[*Continued on page* 128]

Shielded Lead-In Gives Reduction In Noise Level

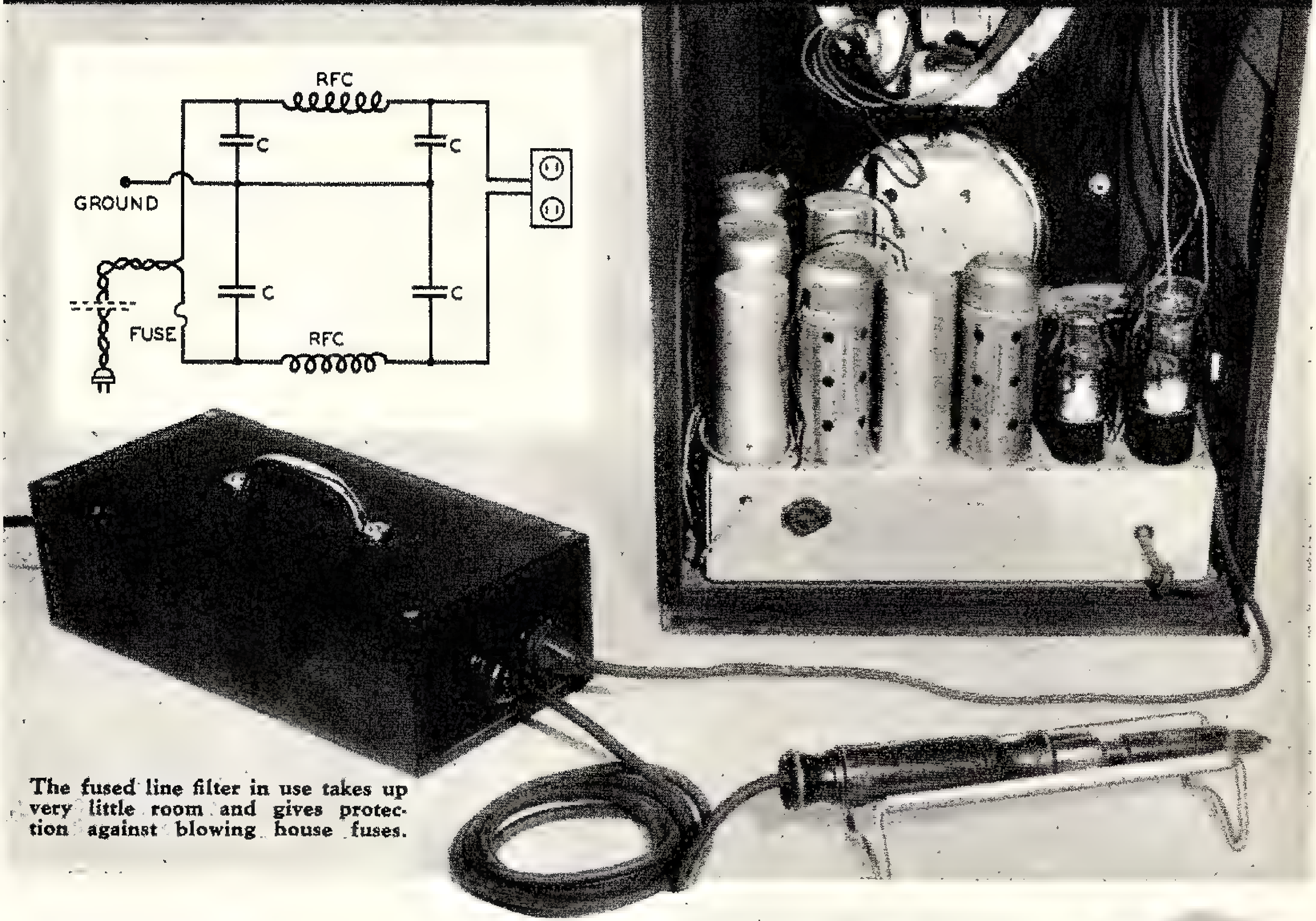

NOISELESS LEAD-IN
COPPER BRAID TO COVER INSULATION
USUAL INSULATION
LEAD-IN WIRE

SPECIAL aerials for reducing man-made interference are usually costly and many times are of no value. One scheme which has been used with excellent success is to use an aerial of ordinary, simple design and connect it to the set with the lead-in shown at the right.

In the sketch is shown the lead-in wire proper that connects to the set and to the aerial wire in the ordinary manner with the usual insulation that surrounds the wire; this insulation should be as heavy as possible. The copper braid covers the insulation; and does not connect to anything. Merely slip it over the heavy lead-in wire from end to end and clip it short at both ends so that the lead-in wire protrudes at both ends. After the braid covers the wire, cover the entire length with paraffin so that the braid does not ground to anything in wet weather.

One effect of using this lead-in is to reduce pickup by the lead-in to nearly zero, which reduces noise and increases the directional properties of the aerial.

A Fused Line Filter



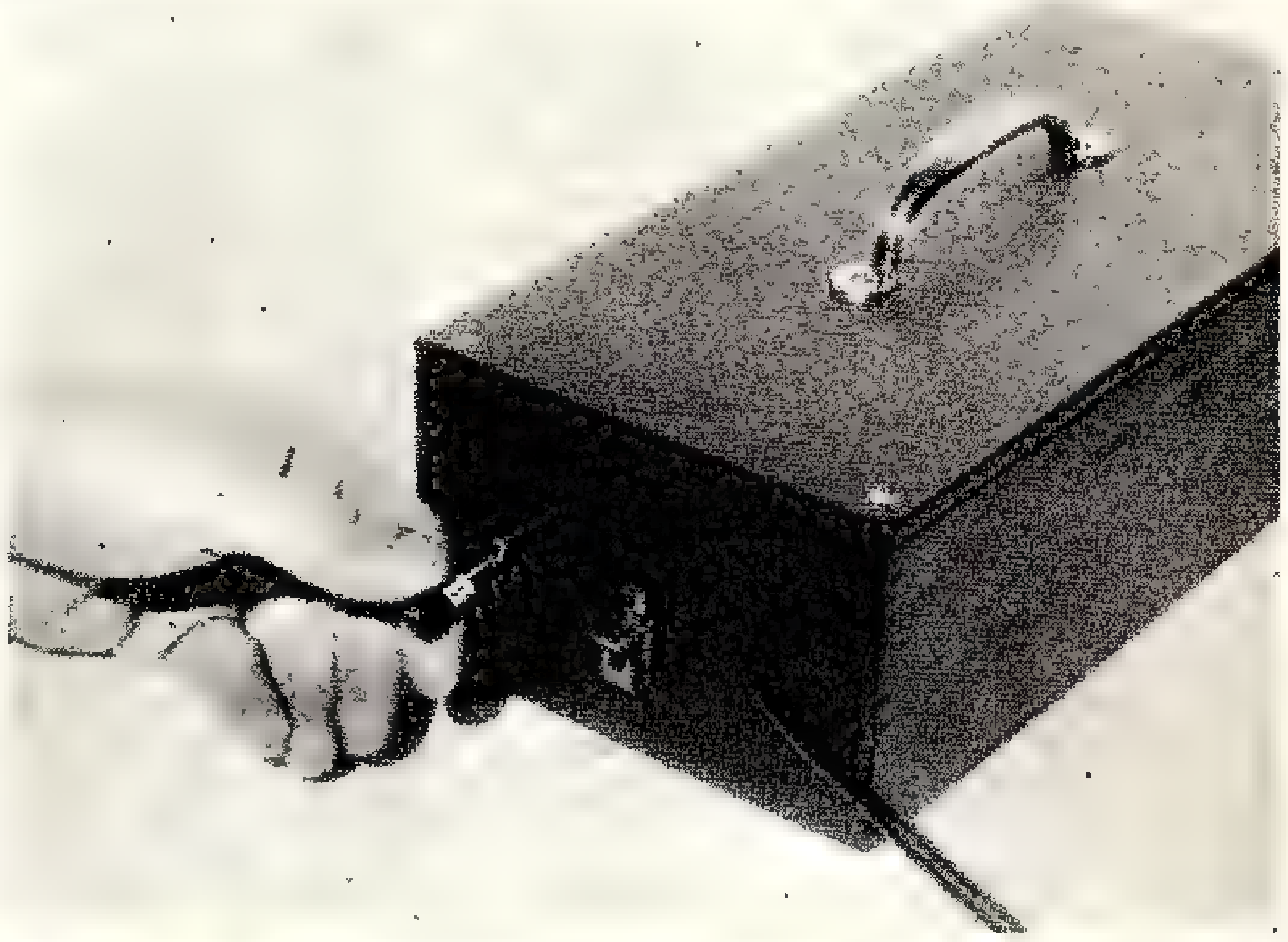
The fused line filter in use takes up very little room and gives protection against blowing house fuses.

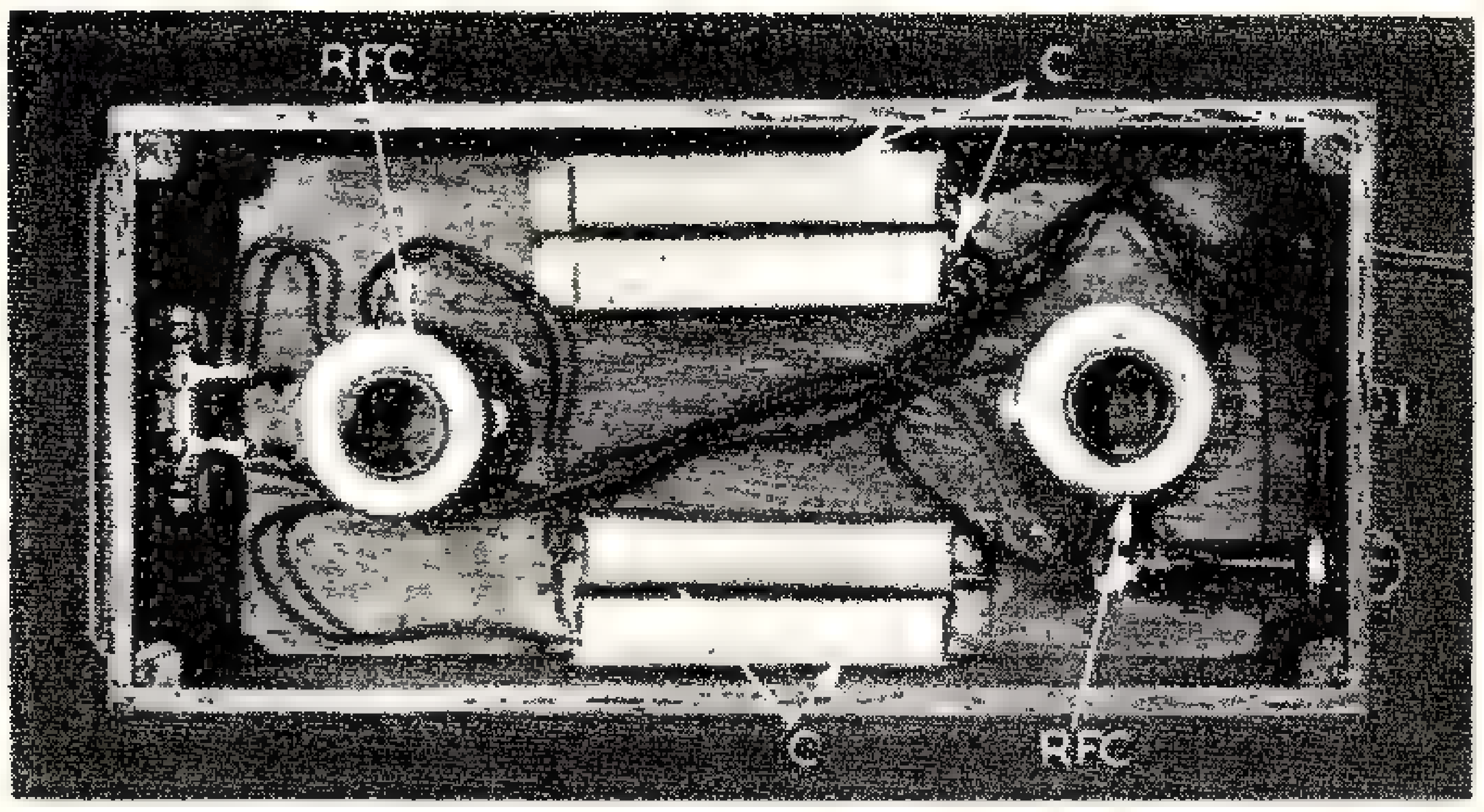
EXPERIMENTERS and radio servicemen will find a fused line filter a handy unit to have for radio testing. By using this unit, the possibility of blowing out the house fuses is eliminated in case of a short in the radio under test. The line filter also eliminates very efficiently, common interference present in the power line.

The filter uses two large size chokes, and four condensers connected in a highly efficient filter circuit. A ground must be connected to the terminal provided, to obtain the best results. The dual outlet will permit the test of two devices, or the extra outlet near the radio for the soldering iron. The fuse may be quickly replaced in the novel terminal block. In locations where line noises are a source of interference, the unit may be installed for permanent use. The line filter will work on any a.c. or d.c. power line circuit up to 250 volts.

PARTS LIST

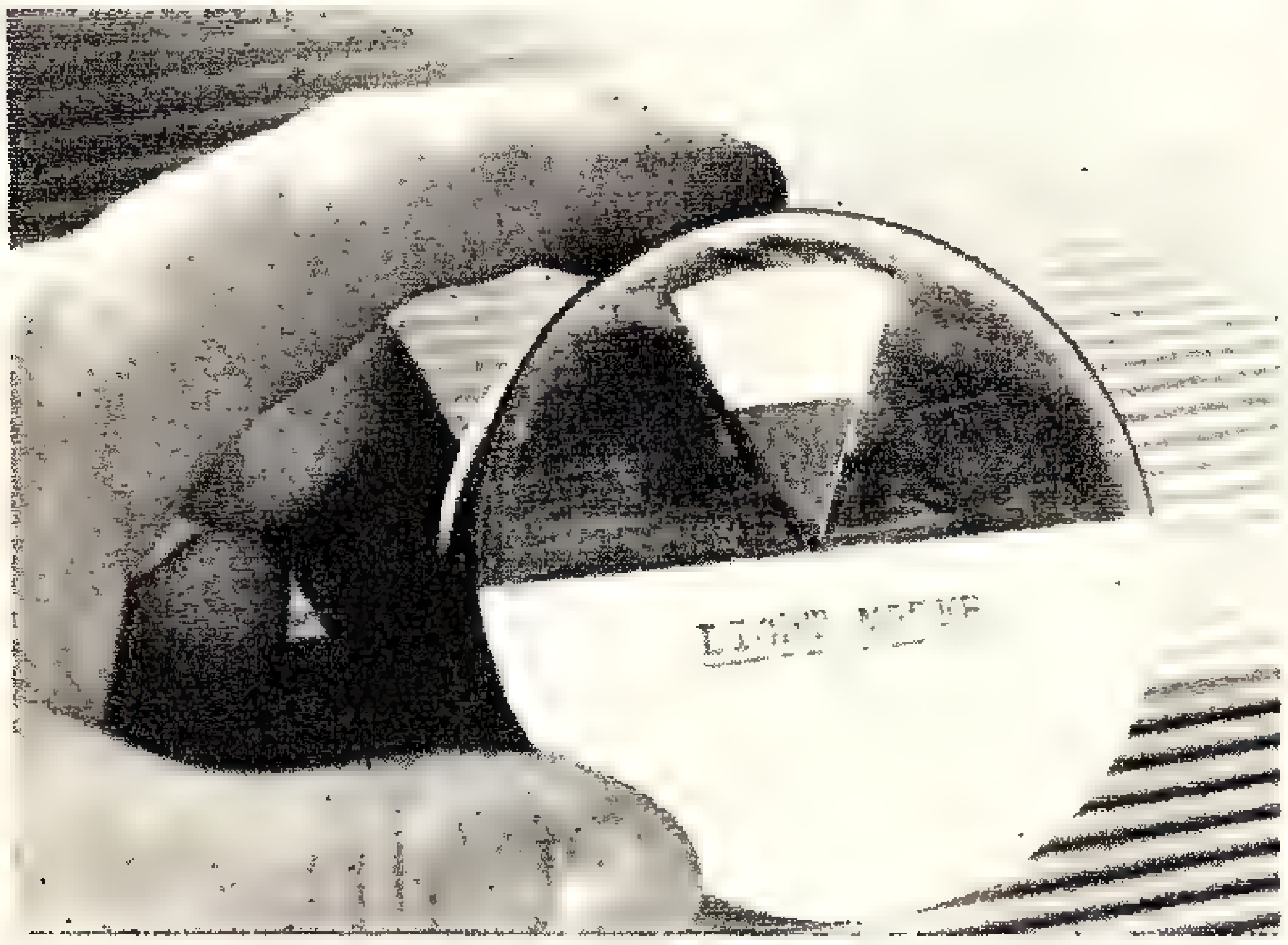
1 Wooden cabinet with carrying handle
1 Power cord and plug
1 Dual outlet receptacle
1 Little fuse holder and five ampere fuse
1 Ground connector
RFC chokes
C Paper condensers, 1 mfd., 600 volt peak





An under view of the filter baseboard showing the parts. The fuse is in the tube at the lower right side. The two choke coils are mounted in the center, and condensers at sides. Note the wiring simplicity.

METER TESTS READING LIGHT



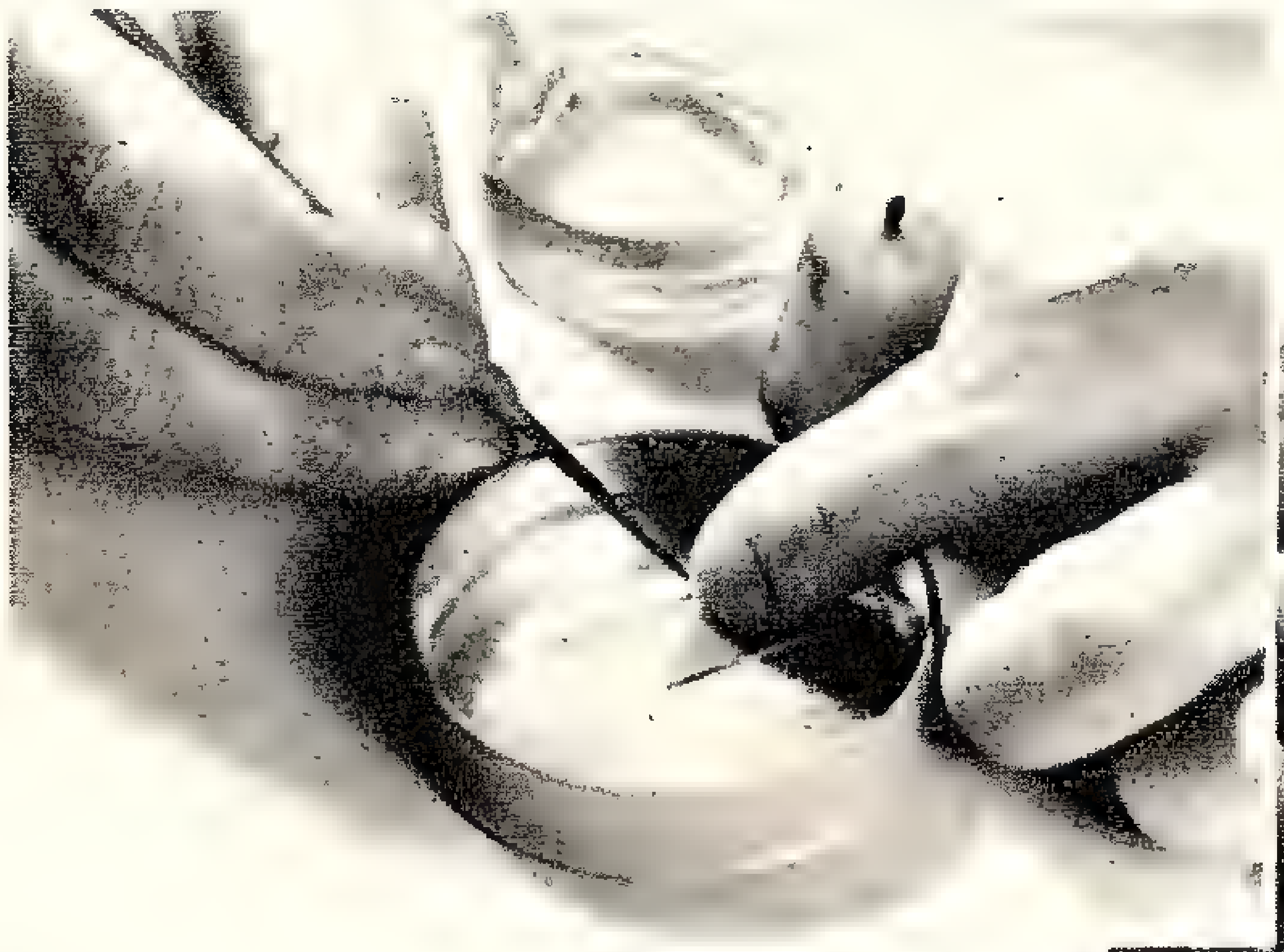
A round typewriter ribbon box makes a satisfactory holder for the light meter. With this device it is easy to test the light-giving qualities of a reading lamp. Of simple construction, it is even easier to use and gives satisfactory results.

IS THE light of your reading lamp bright enough to prevent eye strain? You can easily make sure, and test all of the other lights in your home and shop, with this simple and easily constructed meter. It has a small triangle-shape window through which can be seen a piece of sensitive photo paper, and a piece of darkened "tint" paper. Allow light from the reading lamp to fall on the meter (just as with the electric brightness meters) and note the time required for the photo paper to darken to the shade of the "tint" paper. If this is more than two minutes, the light is not bright enough for normal reading purposes and the bulb should be replaced with one of a higher rating.

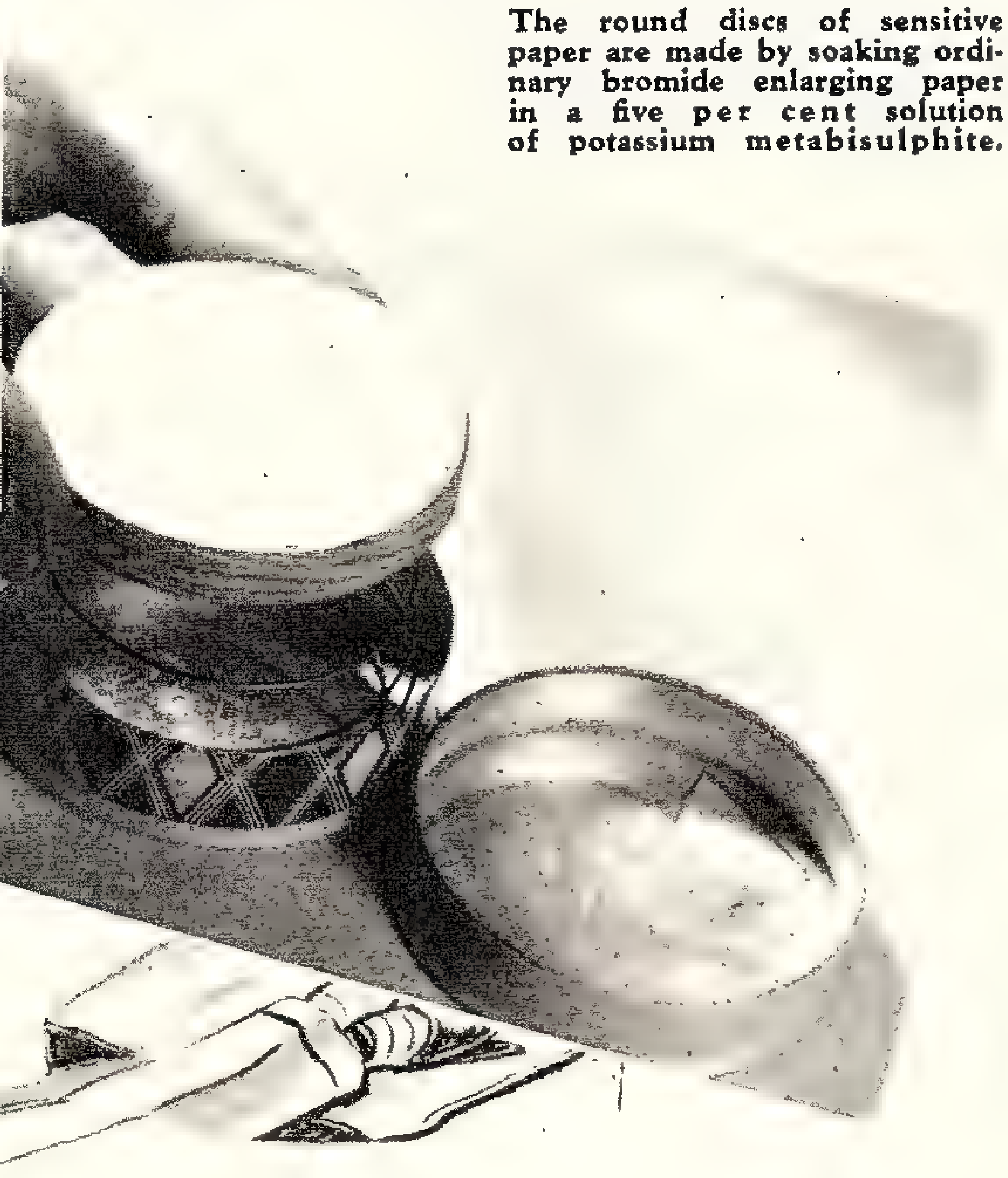
A round typewriter-ribbon box makes a good case for the meter; if you wish, the printing on it can be removed with acetone. To make the window, a good method is to flow the inside of the box with candle wax or paraffin, then scribe the outline of the opening with a sharp point. Cover the bottom of the box with diluted muriatic acid until the triangular piece falls out, leaving a window with smooth, even edges.

The round discs of sensitive paper are made by soaking ordinary bromide enlarging paper in a 5 per cent solution of potassium

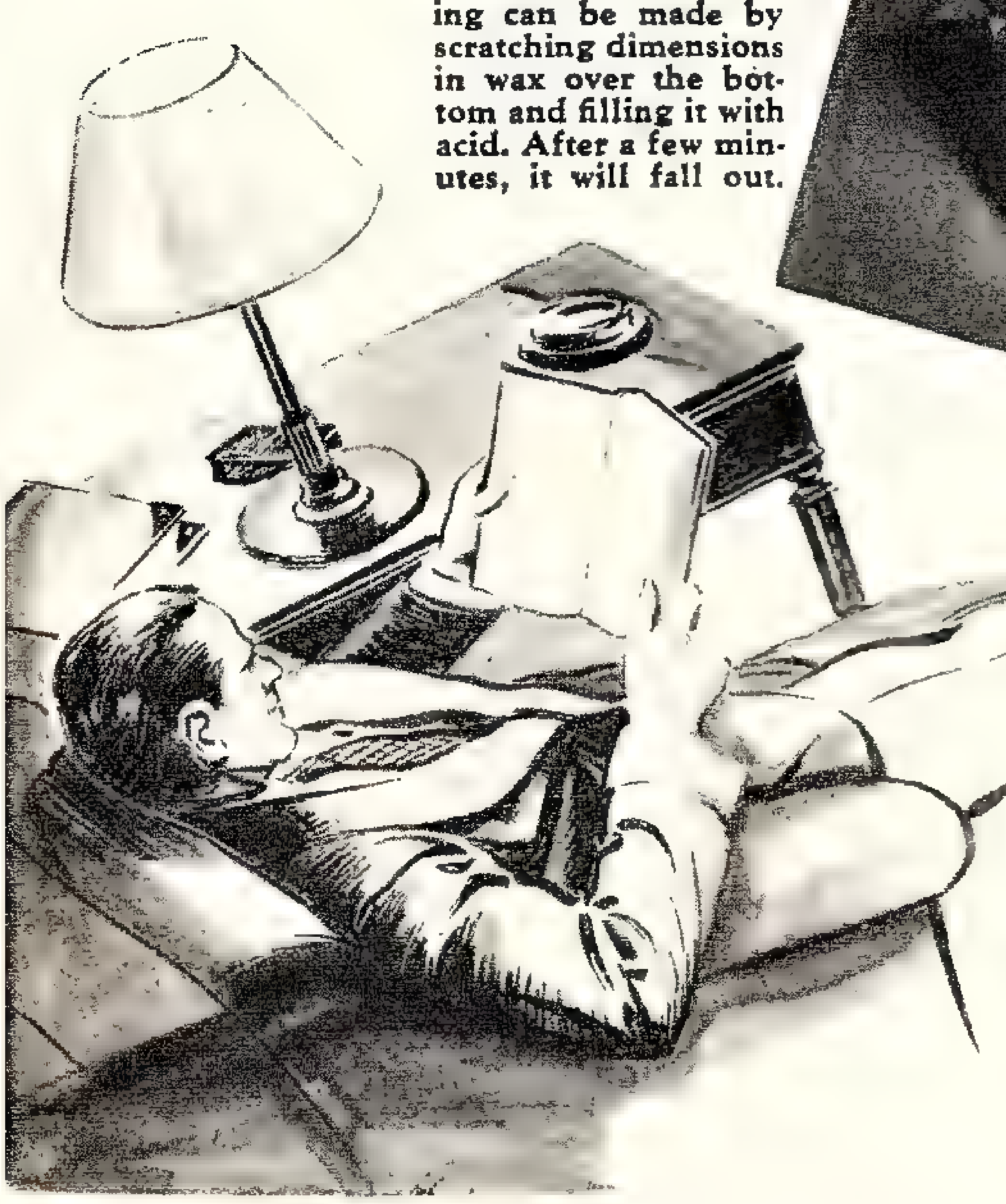
[*Continued on page* 120]



The triangular opening can be made by scratching dimensions in wax over the bottom and filling it with acid. After a few minutes, it will fall out.



The round discs of sensitive paper are made by soaking ordinary bromide enlarging paper in a five per cent solution of potassium metabisulphite.

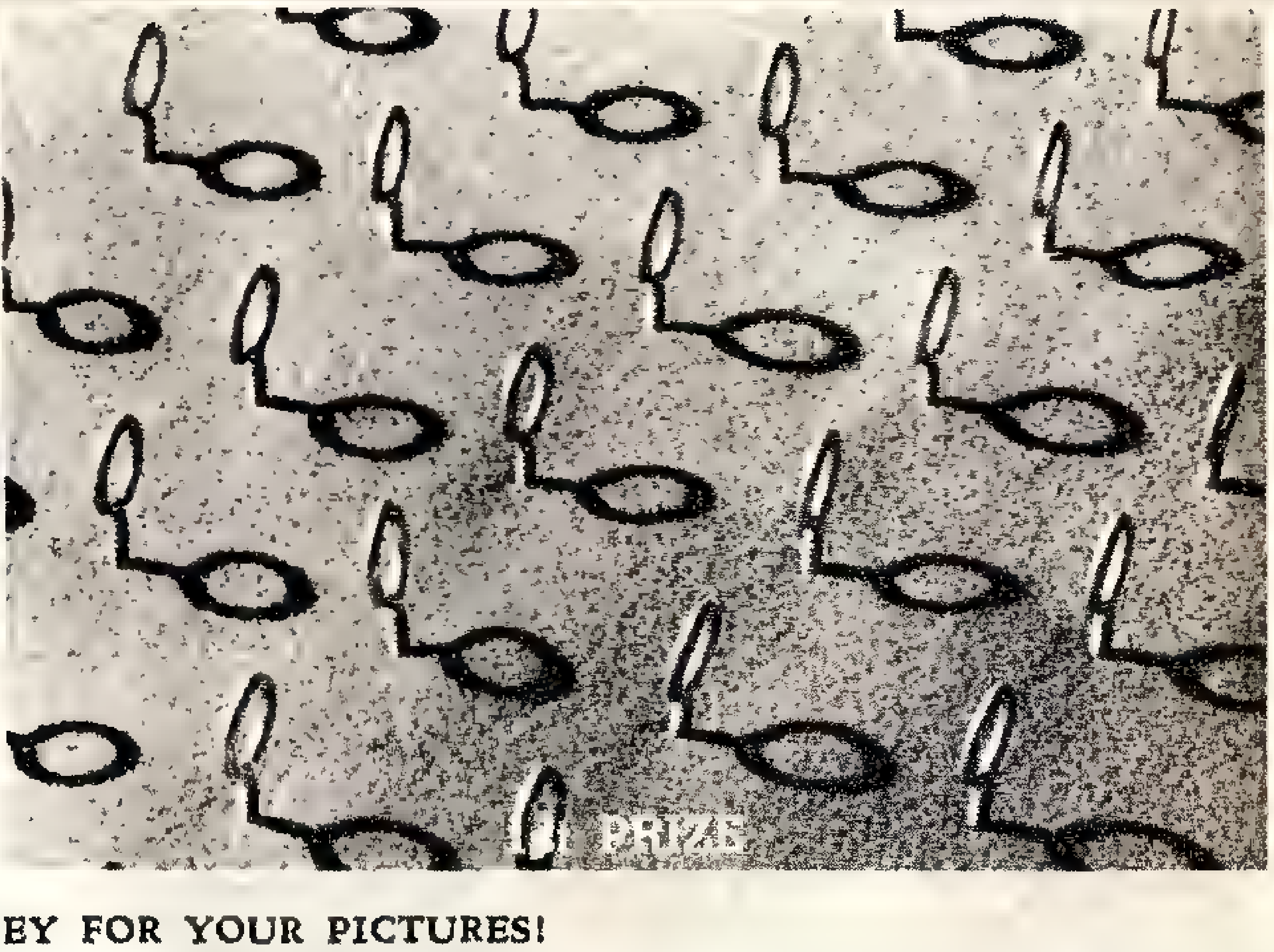


MODERN MECHANIX PHOTOGRAPHY

SECTION

PAGES 103-116

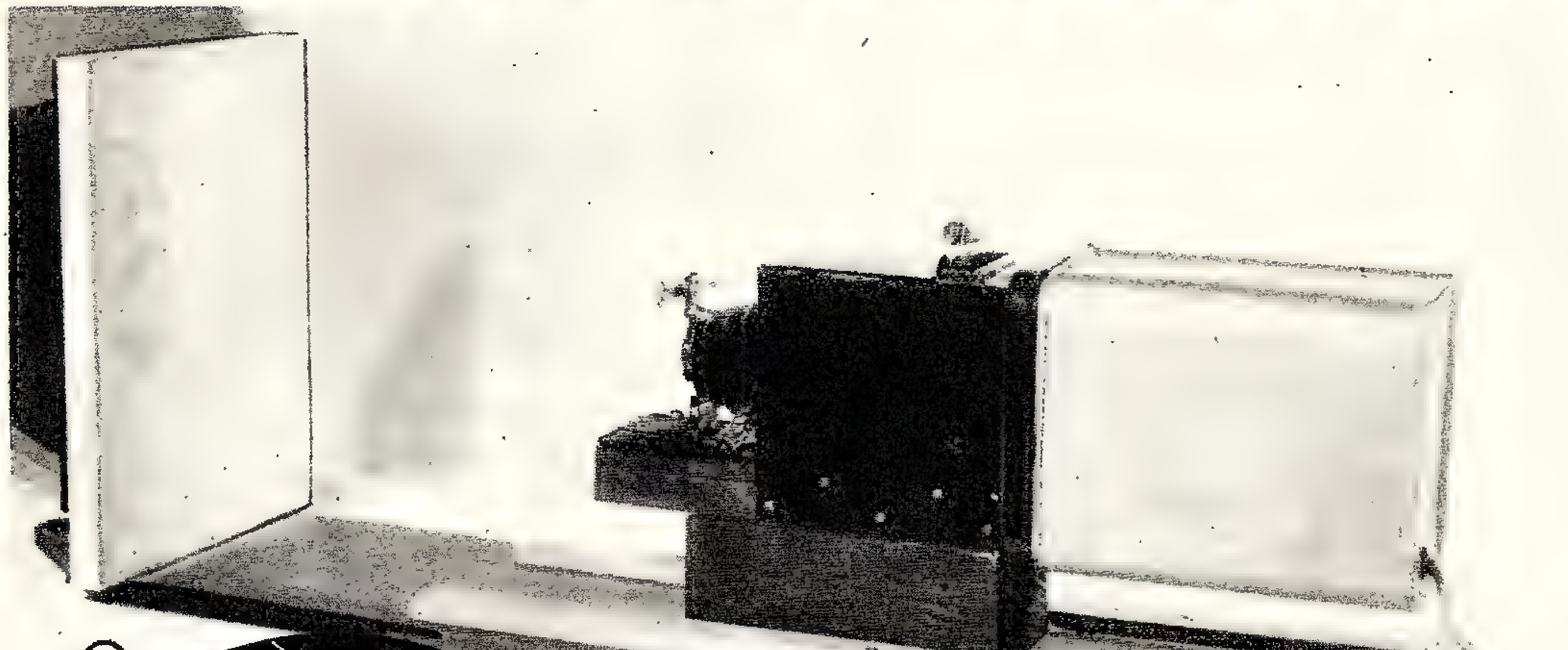
FIRST PRIZE—$15—"Seeing Eye to Eye", by Raymond Rabinowitz, 911 Walton Avenue, Bronx, N. Y. Showing that the simplest objects sometimes make the most interesting pictures. A single spotlight gives the shadow effect. 5 x 7 camera. SECOND PRIZE—$10—"Gingham Silhouette", by Pastor H. Schaller, Tomah, Wis. Made by laying piece of muslin on negative in enlarger. A clever stunt that has many possibilities. THIRD PRIZE—$5.00—to Warren Stormont, 217 East Pine St., Springfield, Ill., for an unusually good candid stage shot made with an ordinary vest pocket Kodak; 1/10 sec. at f. 5.6, super-sensitive pan film, developed in D-76. FOURTH PRIZE—$5.00—"Friends" by Nathaniel Haven, 1370 East Avenue, Rochester, N. Y. An out-of-the-ordinary animal picture. Made with a 3¼ x 4¼" Graflex on portrait pan film, 1/100 sec. at f. 4.5 in dull light. The pose and the expressions are very good. FIFTH PRIZE—$5.00—"Chapel at Sunset", by John H. Crowe, 3230 Bancroft Hall, U. S. Naval Academy, Annapolis, Md. A filter does help! Retina camera, 35 mm. super-sensitive pan film, 1/50 sec. at f. 8 with medium yellow filter. Taken at 6:00 P. M.



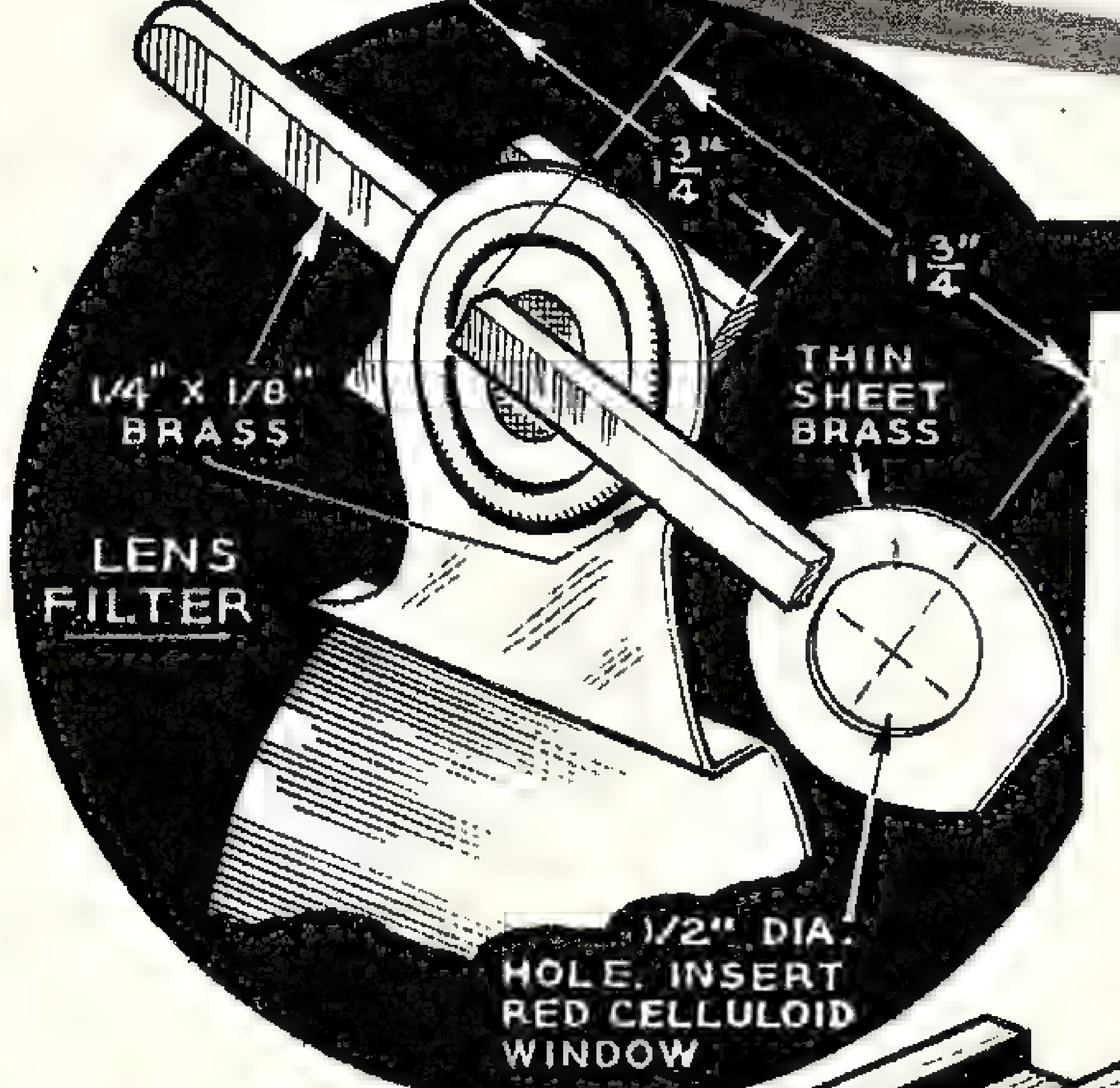
MONEY FOR YOUR PICTURES!

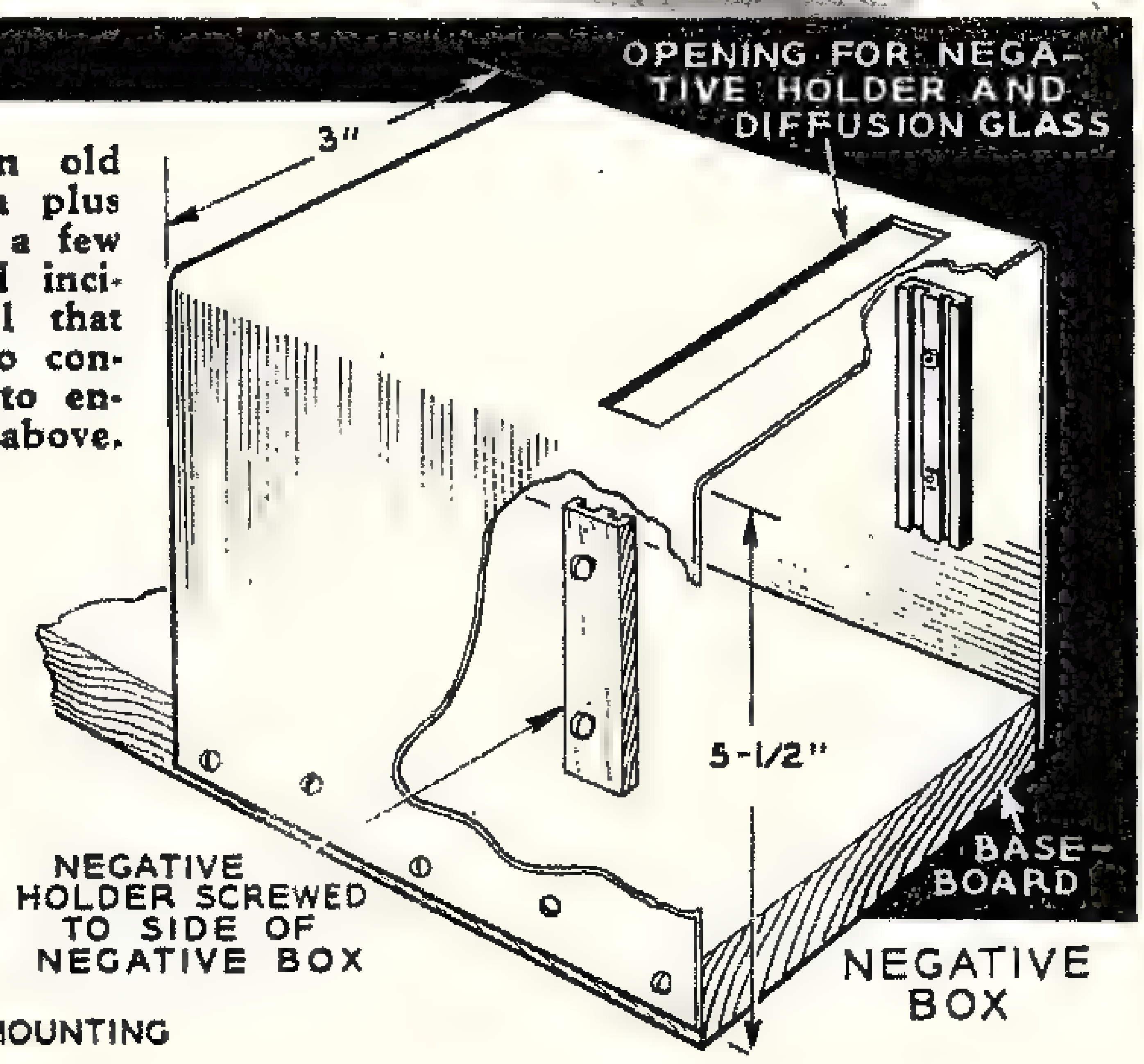
Get busy with your camera and send in unusual pictures of people, animals, machines, trains, airplanes, etc. Each month we will pay $15 for the best picture received from readers, $10 for the second choice, and $5 each for the next three selections. Prints should be glossy, as large as possible up to 8x10 inches (although a small, clear photo is more desirable than a big, fuzzy one) and should be accompanied by the following data: make and size of camera, type of film, and how developed and printed, lens opening and shutter speed, and lighting conditions. Wrap all prints carefully and include postage if you want them returned. Address all contributions to Photography Editor, MODERN MECHANIX, 1501 Broadway, New York, N. Y.

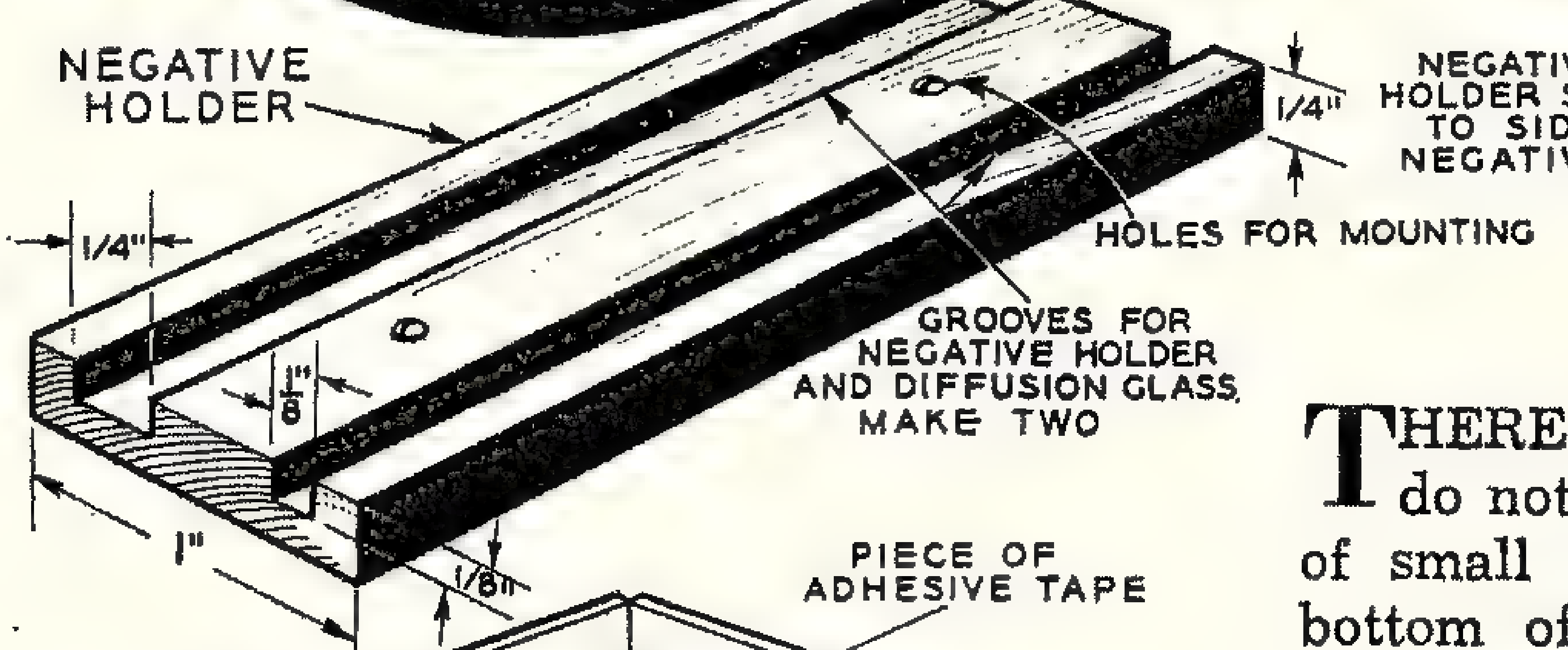
THE "TIN CAN SPECIAL"

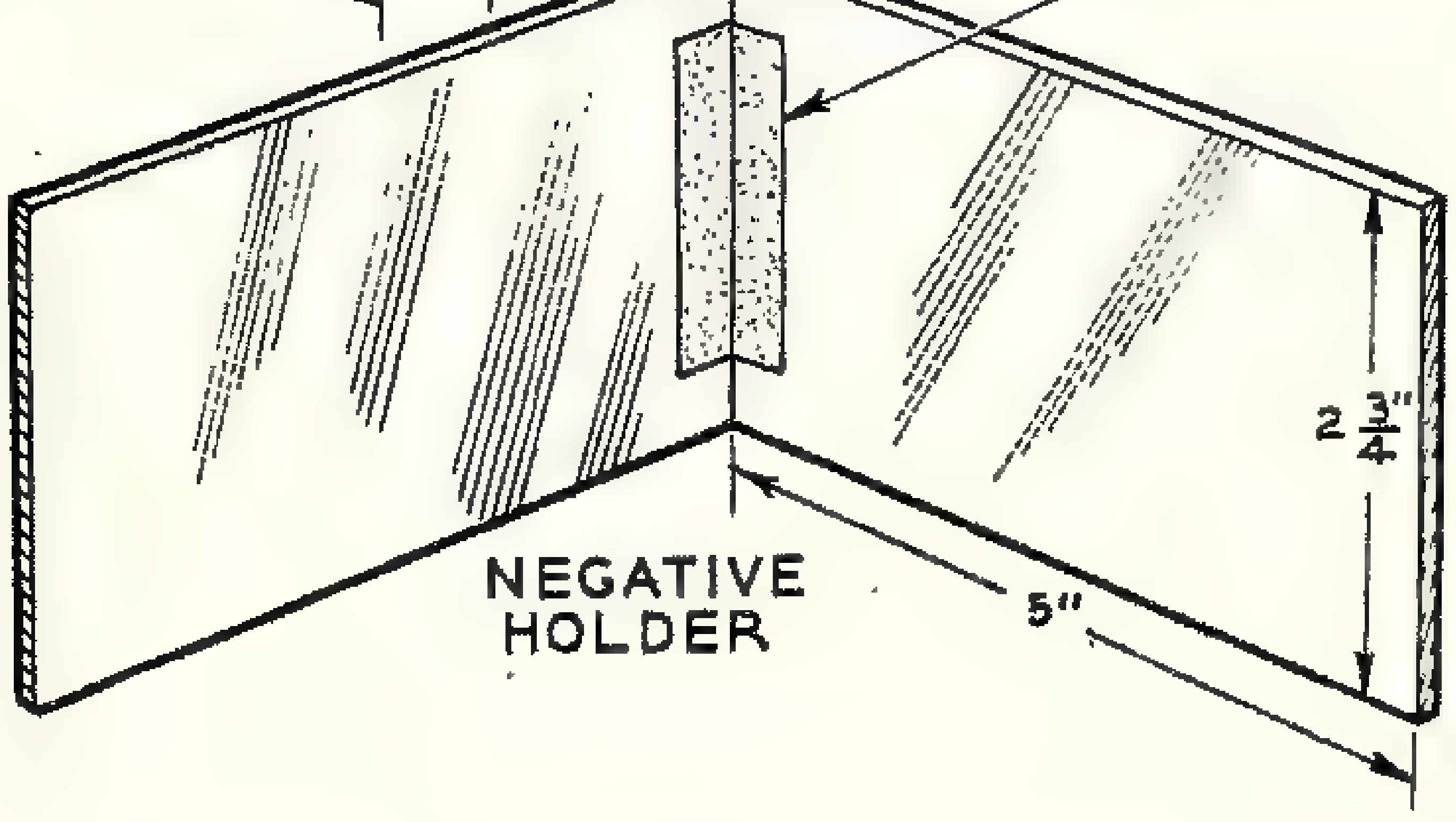


Parts from an old folding camera plus a tin can and a few easily obtained incidentals are all that are required to construct the photo enlarger shown above.


1 3/4"
1 3/4"
1/4" X 1/8" BRASS
THIN SHEET BRASS
LENS FILTER
1/2" DIA. HOLE. INSERT RED CELLULOID WINDOW


3"
OPENING FOR NEGATIVE HOLDER AND DIFFUSION GLASS
5-1/2"
BASE-BOARD
NEGATIVE HOLDER SCREWED TO SIDE OF NEGATIVE BOX
NEGATIVE BOX


NEGATIVE HOLDER
1/4"
1/4"
HOLES FOR MOUNTING
GROOVES FOR NEGATIVE HOLDER AND DIFFUSION GLASS. MAKE TWO
1/8"
1"
1/8"

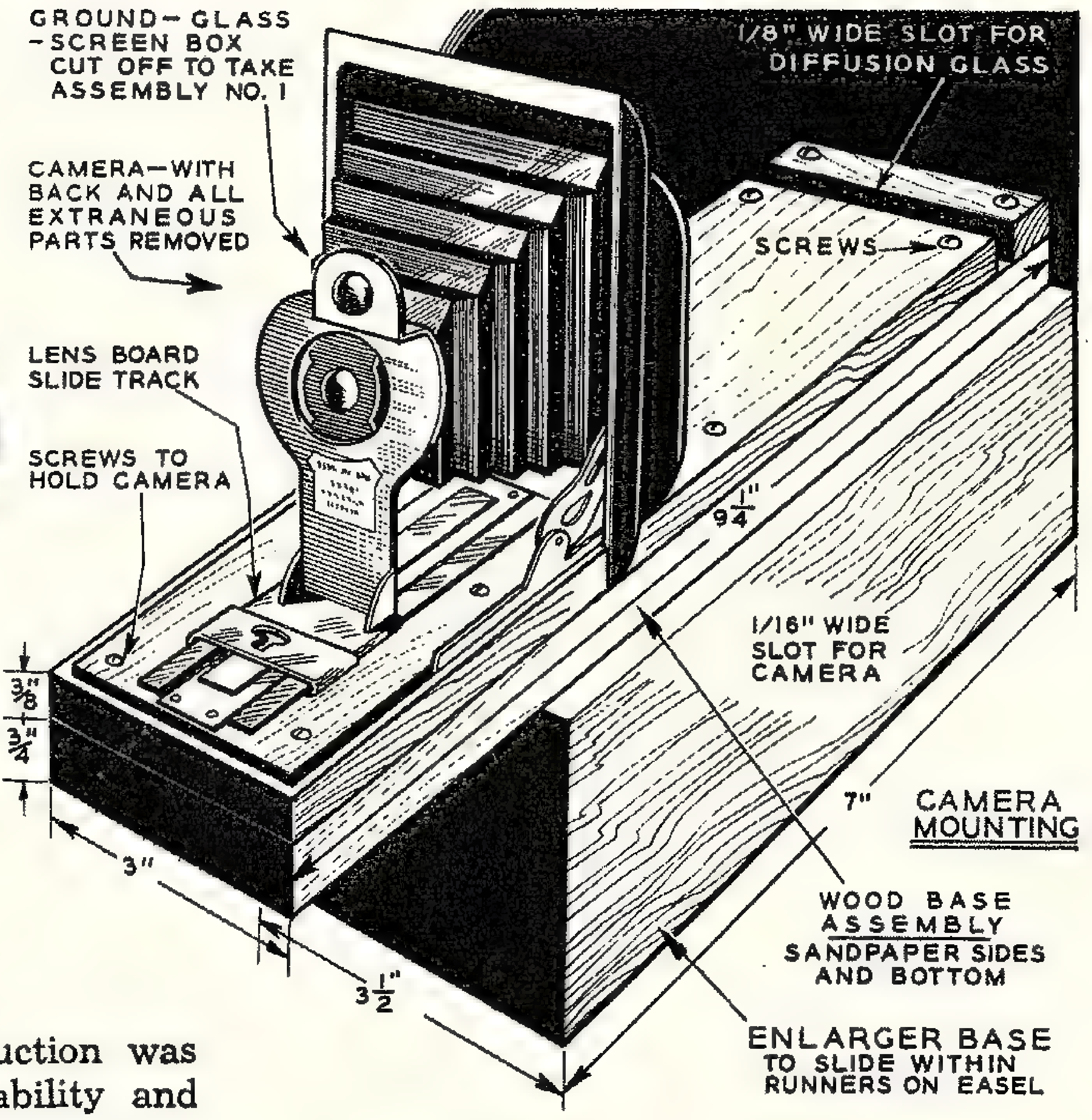

PIECE OF ADHESIVE TAPE
2 3/4"
NEGATIVE HOLDER
5"

The view finder of the camera provides a mounting for the enlarger's lens-filter (top sketch), construction of which is described in text. Center sketch—Construction details of the grooved blocks, which accommodate the negative holder and diffusion glass, as shown in sketch at top right. Two pieces of hinged negative glass comprise holder (above).

THERE are probably few MM readers who do not have an old Kodak or other kind of small folding camera laid away in the bottom of a drawer about the house. In most cases, these have long outlived their usefulness, but the author found an old and battered Kodak No. 2, with its lens and bellows still intact, and considered the idea of making an enlarger out of it. A few scraps of wood and metal, an old tin can, and a piece of glass resulted in a rather nifty-looking piece of apparatus which surprised its not too hopeful builder by turning out fine 8"x10" prints from negatives as small as those used in the popular miniature cameras.

With a photoflood as a light source, the printing time of the home-built enlarger is as fast as that of commercial enlargers with

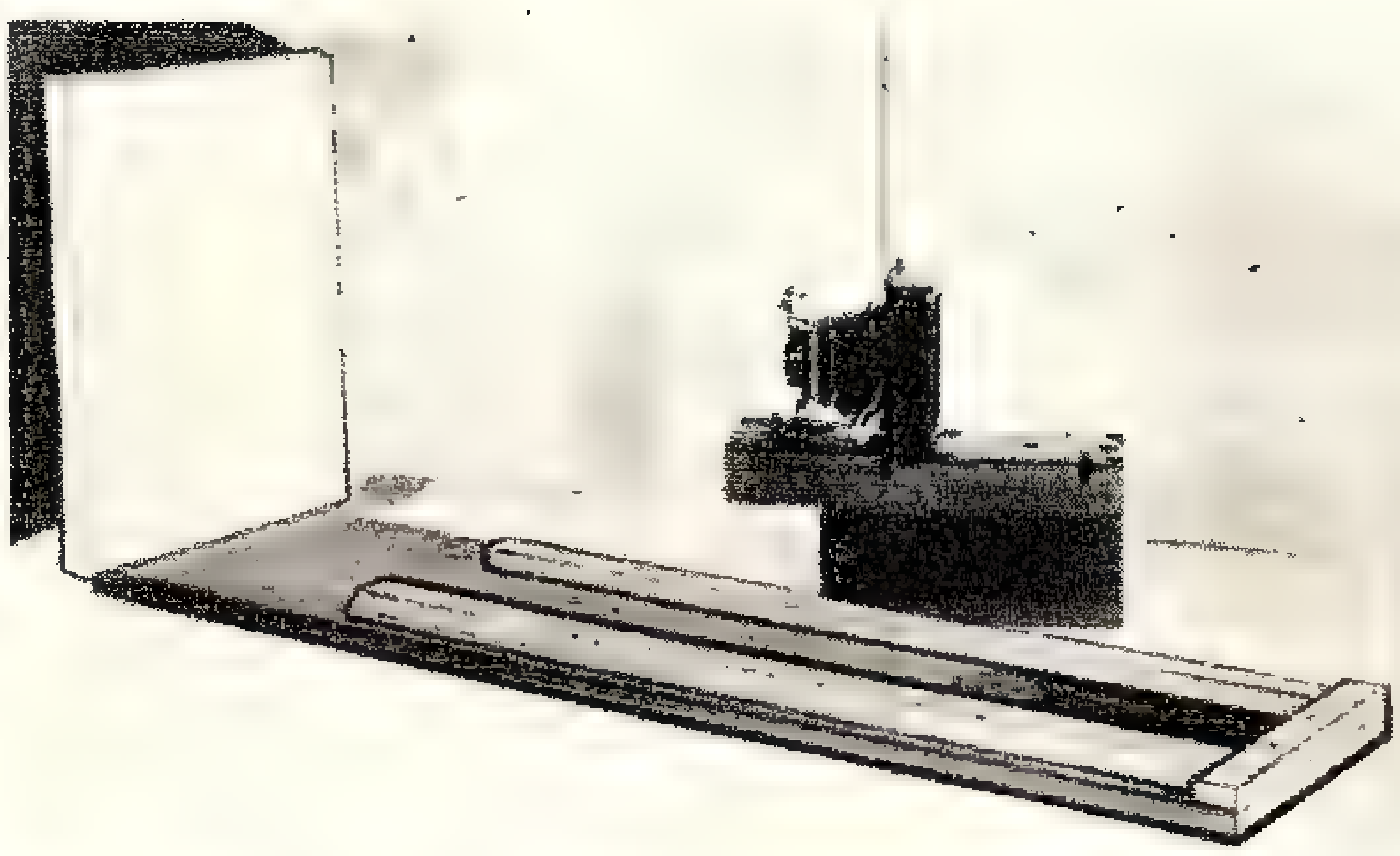
A Practical Photo Enlarger


GROUND—GLASS —SCREEN BOX CUT OFF TO TAKE ASSEMBLY NO. 1
CAMERA—WITH BACK AND ALL EXTRANEOUS PARTS REMOVED
LENS BOARD SLIDE TRACK
SCREWS TO HOLD CAMERA
1/8" WIDE SLOT FOR DIFFUSION GLASS
SCREWS
9 1/4"
1/16" WIDE SLOT FOR CAMERA
7"
CAMERA MOUNTING
WOOD BASE ASSEMBLY
SANDPAPER SIDES AND BOTTOM
ENLARGER BASE TO SLIDE WITHIN RUNNERS ON EASEL
3/8"
3/4"
3"
3 1/2"

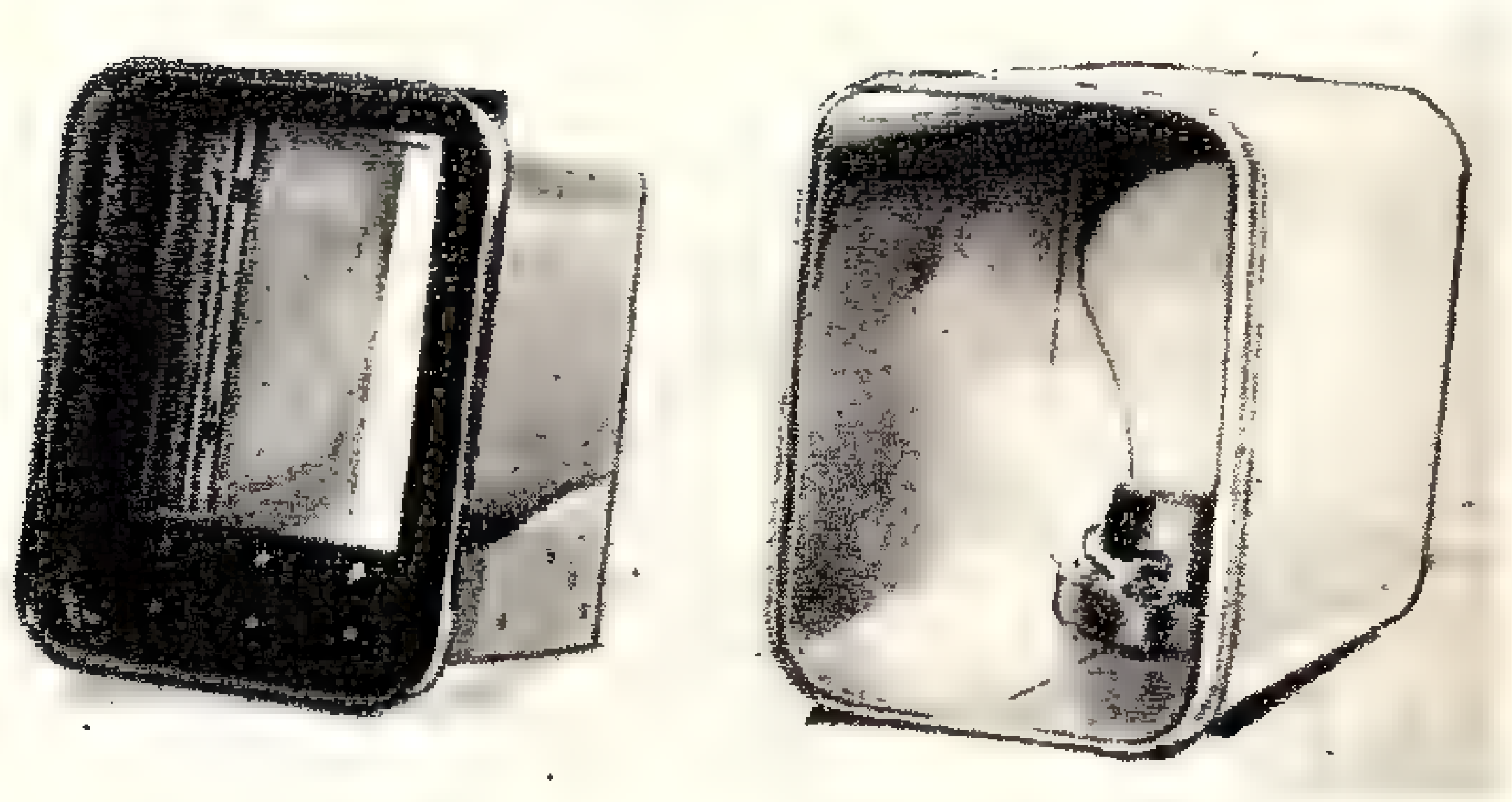
much faster lenses, while the quality of the prints leaves little to be desired. When one considers that a mechanically flexible and rugged job can be made for a ridiculously small amount of money and work, there seems to be no reason why any camera enthusiast should not make his or her own enlargements.

The horizontal type of construction was used because of its inherent stability and simplicity. In the instructions that follow, it should be remembered that the dimensions given in the drawings are for the Kodak No. 2 folding camera. The necessary modifications for a camera of different size can be readily made.

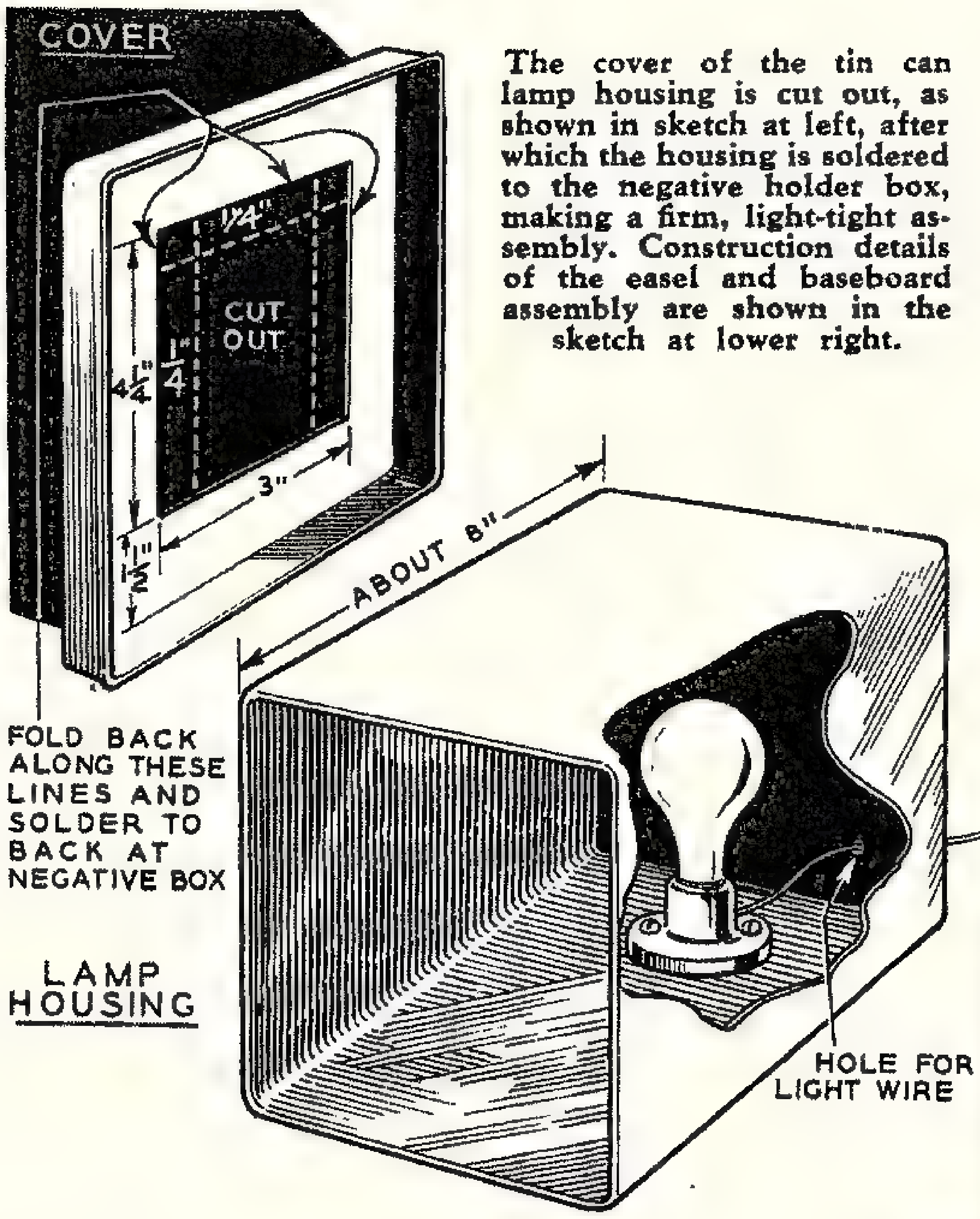
Some minor "operations" are necessary on the camera itself. The back of the camera is removed and can be discarded, since it is not used in the enlarger. Make sure, however, to salvage the little red celluloid window, as it will be useful in making the lens filter, which is placed before the lens when sizing the image on the printing paper. The camera should now be opened, and all extraneous parts removed from the base. This includes the distance scale, the tripod socket, the closing catch, and all miscellaneous rivets and screws except those which hold down the track on which the lens mount slides. Drill four holes, one in each corner of the base, for holding down the camera. Wood screws are driven through these holes into the wooden baseboard assembly, as sketched above. The bottom block of this assembly should be sand-papered on its sides and bottom, since it slides on the enlarger base, as the photographs and sketches show. The total height of this whole assembly is such that the lens is on a direct line with the center of the easel.



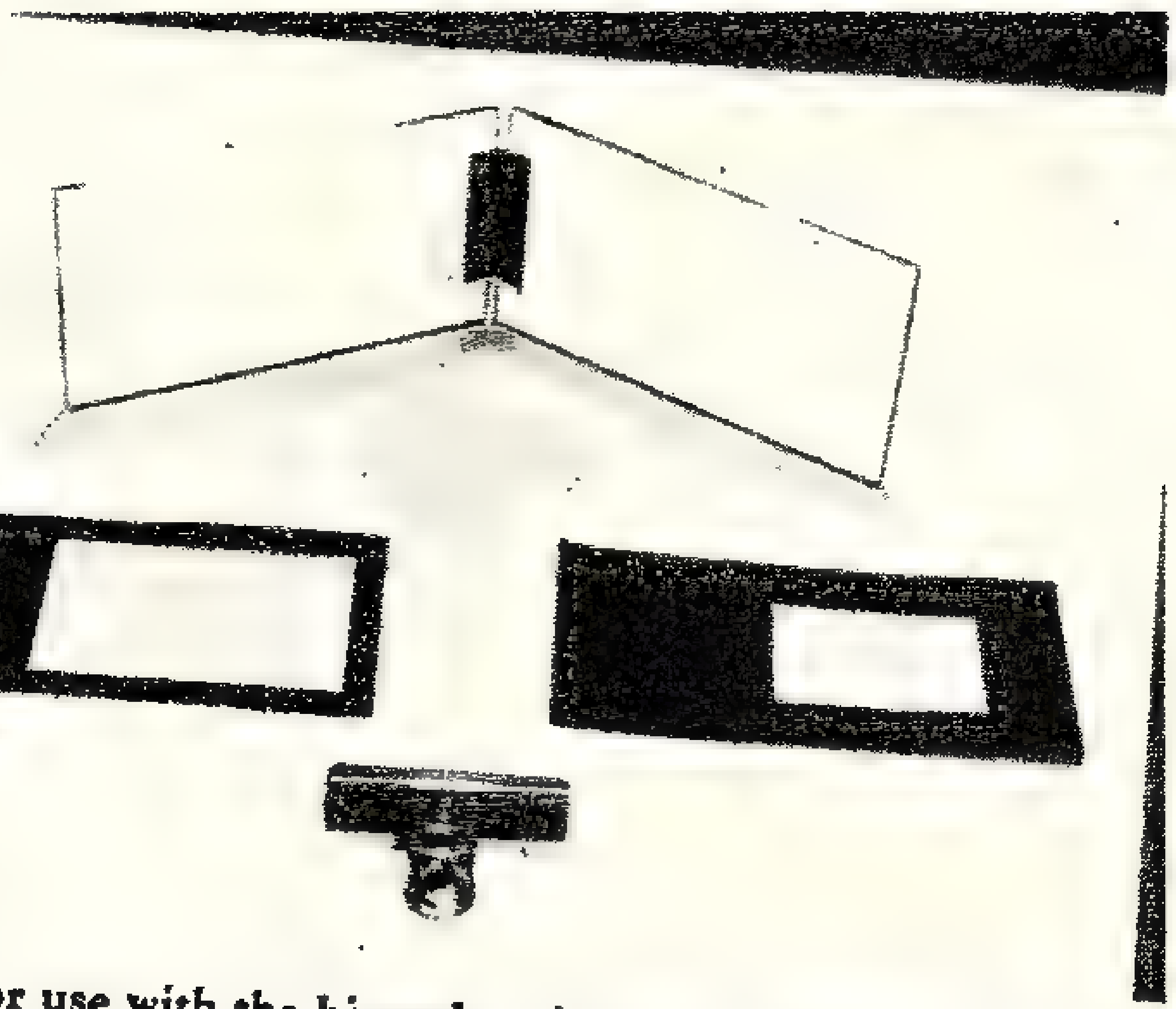
The sketch at top of page shows complete details of the camera mounting on the wooden assembly base. Above—Completed easel and enlarger baseboard with camera mounting slide-guides. A tin can serves as lamp housing for enlarger (below).



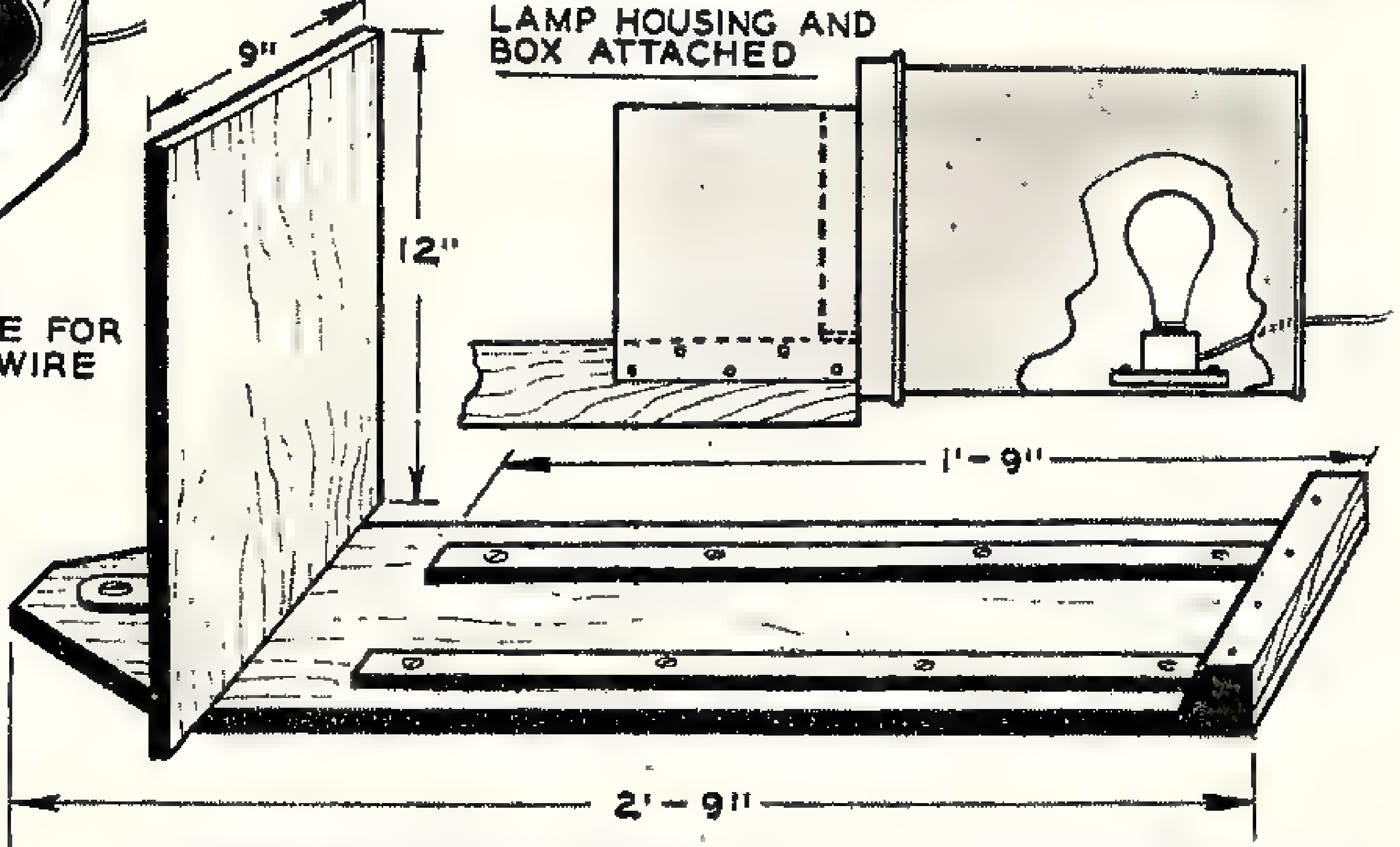
The view-finder on the camera provides a convenient mounting for the lens-filter, since it can be swung around in and out of position. The small right-angular box holding the ground-glass screen is sawed off flush and then filed clean. Short lengths of brass rod are then soldered on the screw and nut



The cover of the tin can lamp housing is cut out, as shown in sketch at left, after which the housing is soldered to the negative holder box, making a firm, light-tight assembly. Construction details of the easel and baseboard assembly are shown in the sketch at lower right.



Masks for use with the hinged optical glass negative holder are cut from black paper, as shown above. The spring-type paper clip serves as a handle for the holder.



BASEBOARD AND EASEL OF 3/4" STOCK. GUIDES AND BACKSTOP OF 1/2 MOLDING OR QUARTER ROUND

portions as shown on page 104. The front piece is cut short and a small vane of thin sheet brass is soldered to it. A one-half-inch hole should be made previous to soldering, and the red celluloid window inserted after soldering, so that it will not be burned. When soldering the brass rod onto the rear section, care should be taken that too much heat is not applied as this piece is made of zinc, and melts very rapidly. The rod is used as a handle to swing the filter in place before the lens.

The author found by experiment that the best compromise between maximum and minimum enlargement size was secured when the negative was placed about three inches back of the normal position used for taking pictures with the camera. This allows the entire length of the lens track to be utilized. It was therefore necessary to add a box-section to the camera. This section contains grooves into which the negative-holder and the diffusion glass are slid in position. Dimensions for this box are shown on page 104.

The box should be made of thin sheet brass or galvanized iron, so that soldering to it is easy. It should be bent into shape, and a rectangular hole cut in the top. This is the opening for the lens-holder and diffusion glass. The grooves to accommodate the negative holder can be cut in pieces of one-fourth-inch Masonite by a routing tool in a drill press. This is the best method for cutting straight grooves. The grooved pieces should be screwed to the inside of the box as shown on page 104.

The negative-holder consists simply of two pieces of negative glass hinged together with a short piece of insulating tape or surgical adhesive, as shown in the sketch on page 104 and the photo above. Negative masks up to the 2¼"x3¼" size are cut from black paper. When folded up, the negative-holder is fastened on top with an ordinary spring paper fastener, which also serves efficiently as a handle.

The diffusion glass is a piece of flash glass of the same dimensions as the negative-holder. Its use is most essential, since even illumination of the negative is impossible without it. The diffusion glass slides into place behind the negative-holder in the grooved slots within the negative box. Flash glass and negative glass can be purchased for a nominal sum from any camera supply shop. The 5"x7" size is best and it is easy to cut to pieces of the proper size if the following

[*Continued on page* 120]

FILTER FACTS AND FACTORS

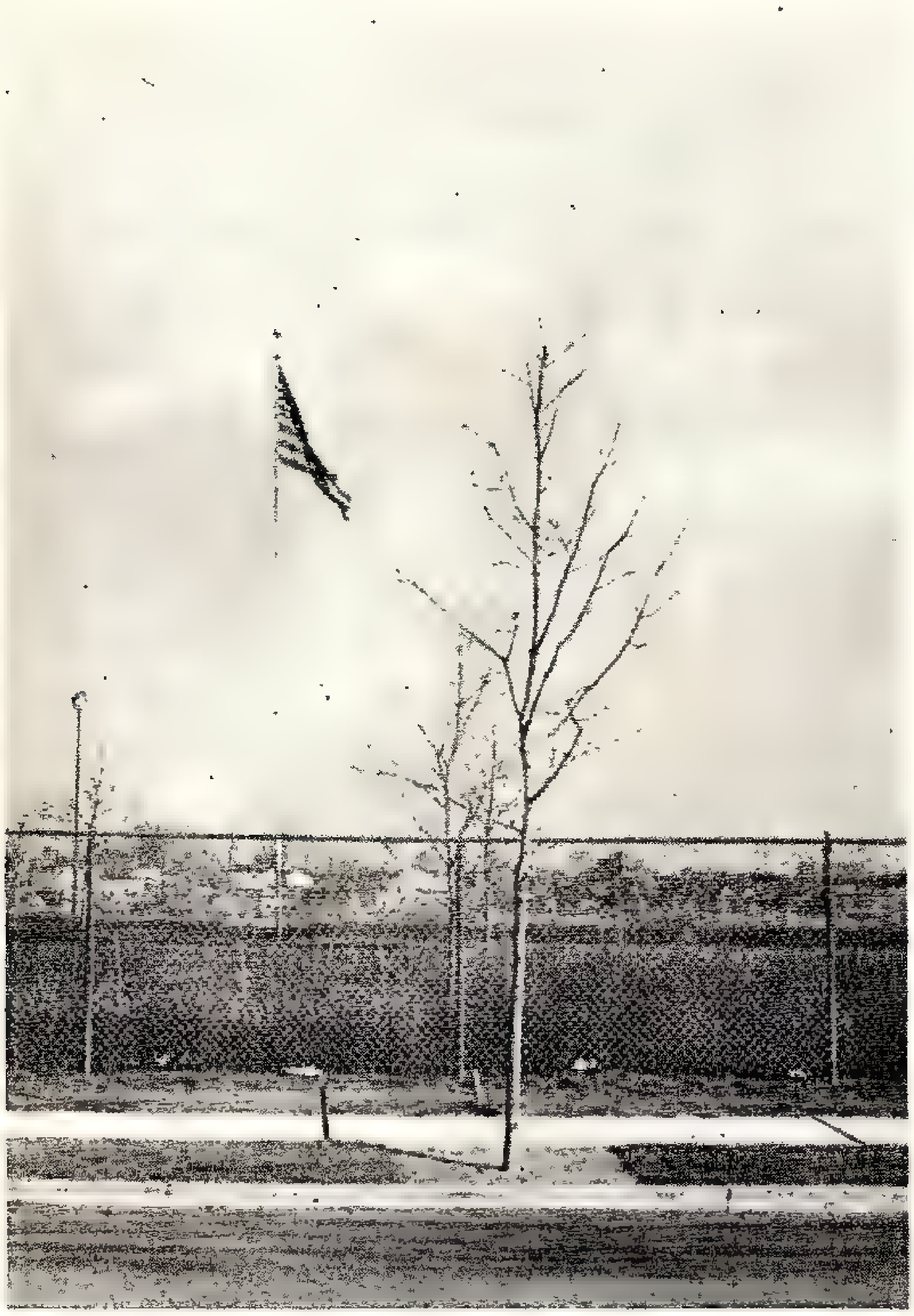
How to improve pictures by controlling color of light that reaches film.

BECAUSE of the current widespread interest in color photography, there is a general impression among amateur photographers that the "color filters" they see advertised so widely are exclusively part of the process of making colored pictures. This isn't so. From the amateur standpoint "color filters" are much more important for the making of black and white pictures than colored ones; in fact, the only two color films available for amateur use do not require lens filters at all. If this sounds a little confusing, let us consider the general nature of light and it will all clear up quickly.

What we see as white light is actually a mixture of the colors of the rainbow, appearing in this order: violet, blue, green, yellow, orange and red. Next to the violet there is also ultra-violet, and next to the red, infra-red (heat rays), but both of these extremes are invisible to the eye. However, the ultra-violet strongly affects all photographic films and must therefore be remembered, while the infra-red registers only on very special plates, and for all practical purposes can be ignored.

Above: An X1 (pale green) filter, used with Panatomic film, gives correct "color" balance to this charming scene and helps to bring out the clouds in the background. Left: Without a filter, the clouds in this picture would be completely lost, and the outline of the girl would merge with the sky. The use of a K2 (medium yellow) filter saves the scene.

When we speak of the "color sensitiveness" of films, we refer to their ability to record these varying colors as different gradations of black and white on the eventual prints on white paper. For instance, the various films bearing trade names ending in "chrome" or some variation thereof (technically, these are "orthochromatic" films), are affected by the rays of the spectrum from the ultra-violet through the violet, blue, green and into the yellow. Red light doesn't register on them, and red objects therefore come out black in the print. For the same reason, these films can be opened and examined in a dark room under a red "safelight."

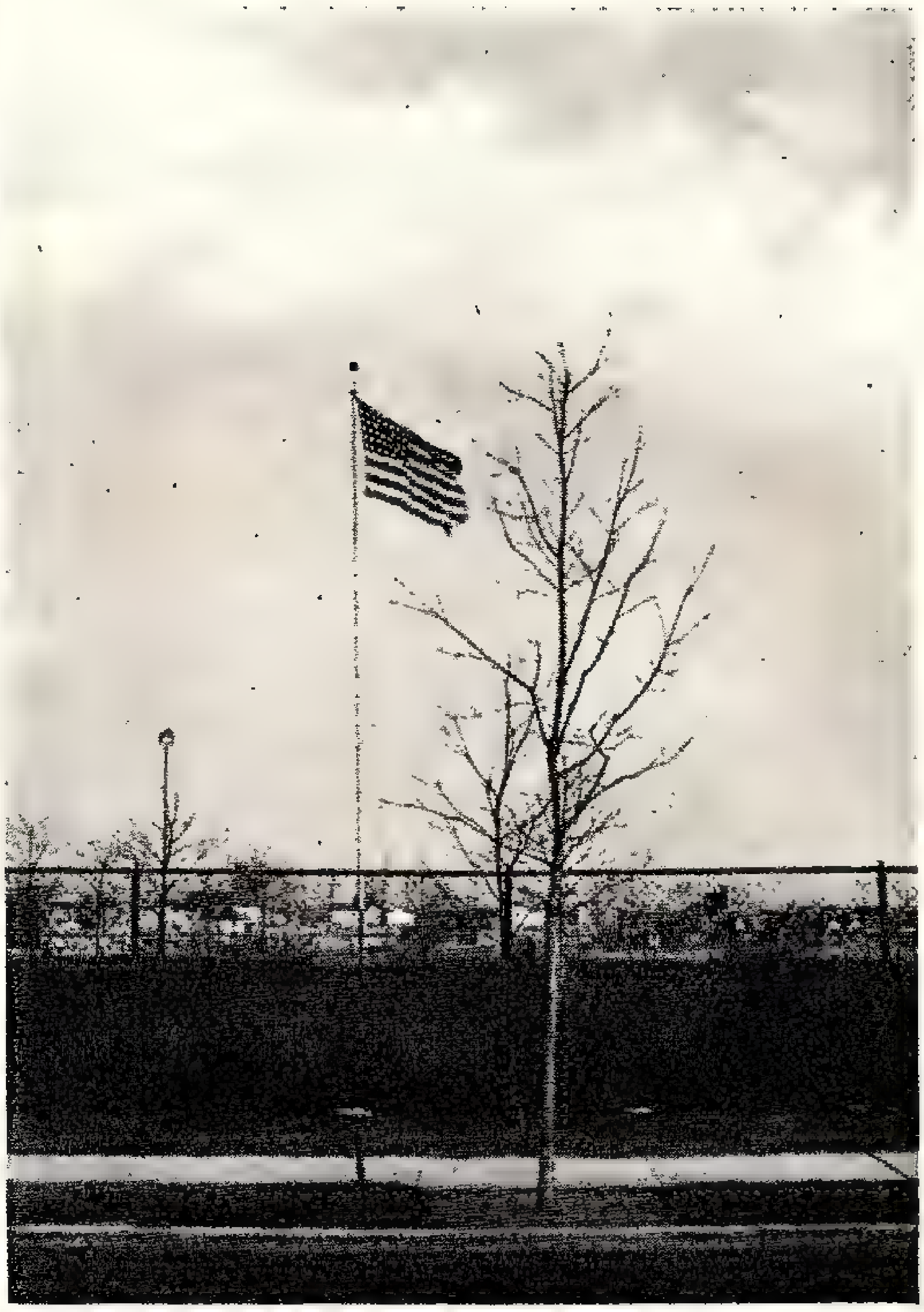


These three pictures graphically show the value of lens filters. The view above was taken on a dull day with regular supersensitive panchromatic film, 1/50 second at f.14, without a filter. The heavy clouds in the sky are barely perceptible.

Films of the "pan" type ("panchromatic") respond to the entire visible spectrum, from the ultra-violet up to and including red, and therefore they register red objects as gray tones of varying depth; also, they must be opened only in complete darkness, as no "safelight" is longer "safe" for them. However, regardless of the type of film, they still are most sensitive to the ultra-violet, violet and blue. Sky light is especially rich in these colors, a fact to be kept in mind.

Photographers use cameras to make permanent records of what their eyes see, but unfortunately, the color sensitivity of the human eye does not coincide with that of films. The eye is most sensitive to green, less responsive to blue and violet, and totally blind to ultra-violet. Thus, a landscape that appears gorgeous to the eye because of rich green foliage and blue sky turns out to be a very disappointing photograph when made on ordinary film. In the black and white print the trees and grass look too dark, the sky too light. This is easy to understand now, because we know that the ultra-violet, violet and blue light of the sky registered much more strongly than the green of the fields, throwing the photographic picture entirely out of balance with the visual picture. To restore this balance, we must restrain the powerful blue rays without affecting the other colors; for this purpose we put a piece of colored glass or other transparent substance in front of the camera lens, and we call this attachment a "filter."

The name fully describes the action. Light rays of any desired color are allowed to pass through to the camera, while others are entirely or partially absorbed, and therefore have no effect on the film. There are dozens of different shades of filters, intended for specific applications in many photographic fields, and their study is an extremely interesting one for the advanced experimenter. For the amateur, however, one, two or at the most three filters will take care of all ordinary requirements in pictorial and landscape work.



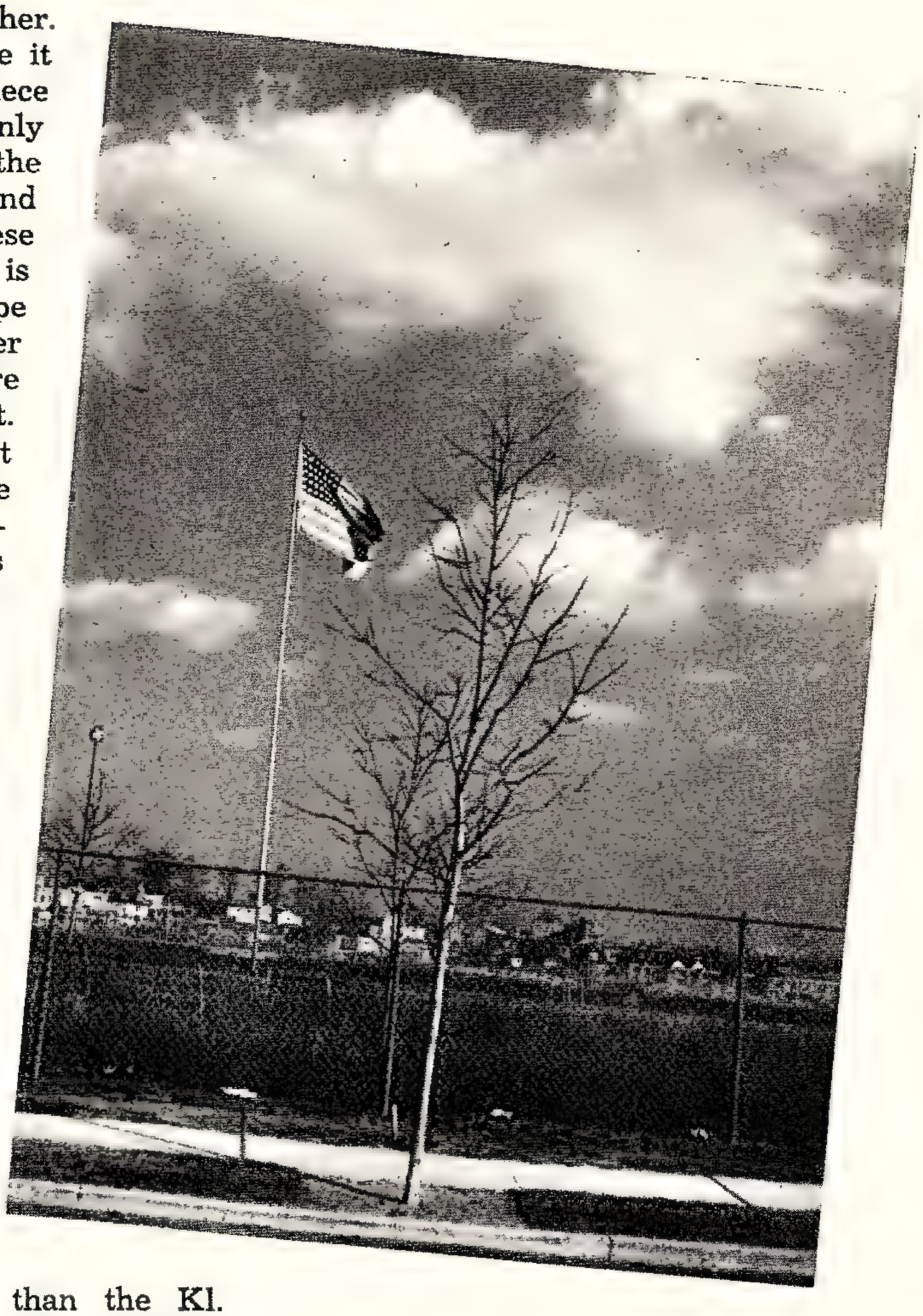
This is the same scene, taken a few seconds later with a K2 yellow filter, 1/50 second at f.11. The clouds now show fairly well.

Any object will appear colored if by its nature it eliminates one or more of the components of white light. Grass appears green, for instance, not because it reflects green but because it absorbs blue on one side of the spectrum and red on the other. A red filter looks red because it absorbs blue and green. A piece of glass which holds back only blue light looks yellow to the eye because it passes red and green, and a mixture of these colors becomes yellow. It is obvious from the landscape problem that a yellow filter would have saved the picture by restraining the sky light.

The yellow filter, in different depths, is unquestionably the most useful of all. It is invaluable for outdoor scenes in which the sky shows prominently, because in restraining the ultra-violet and blue of the actual sky, it makes white clouds stand out beautifully. A yellow filter in many cases means the difference between an ordinary snapshot and a prize-winning salon masterpiece.

The "Kl" is a pale yellow filter and is used when a short exposure is more important than a high degree of correction. The "K2" is the most popular and widely used filter in photography, and brings out clouds more definitely than the Kl. When used with super-sensitive panchromatic film in daylight, a very close approximation to true orthochromatic rendering of the subject will be obtained; that is, all colors will be registered correctly. It can be used very successfully with any of the "chrome" films. The "G" is a deep yellow "contrast" filter, and cuts through atmospheric haze effectively. It is also useful in providing good contrast between snow and shadows in snow scenes.

The "Xl" is a pale green filter designed to give complete color correction with super-X panchromatic and Panatomic film in daylight. Such occasions arise, for instance, with flowers containing a mixture of red, yellow and green. The Xl is also helpful in making photos of a person's face against the sky. Under artificial light, the Xl is used with super-sensitive panchromatic film for complete correction. The Xl cannot be used with other than pan type films.



Still the same scene, but photographed through an "A" red filter, 1/50 second at f.7. The sky looks almost black.

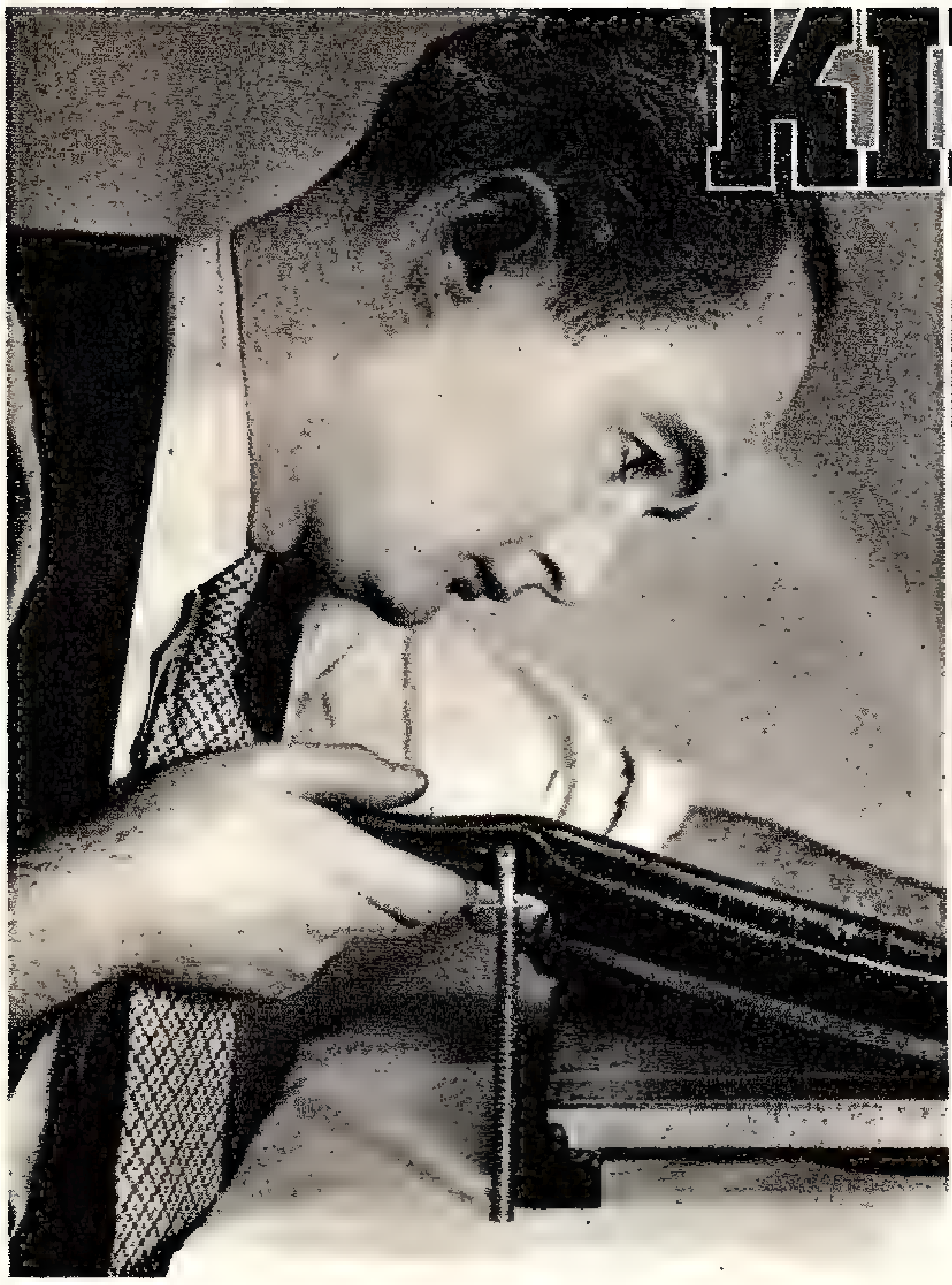
The X2 is a deeper green filter, and is used with super-X and Panatomic films for correct color balance in black and white with artificial light. It has no use with daylight.

The "A" filter is red, and is of special advantage is recording clouds against the sky, making the latter come out almost black. Pictures taken in full sunshine with this filter sometimes have a night-time appearance. Some startling effects can be obtained with this filter if it is used carefully.

A second feature of the use of a yellow filter is the better detail recorded of distant objects. During the summer, distant hills appear somewhat hazy because the haze (which is due to fog-like accumulations of moisture) scatters blue light and tends to blur scenes seen through it. However, it

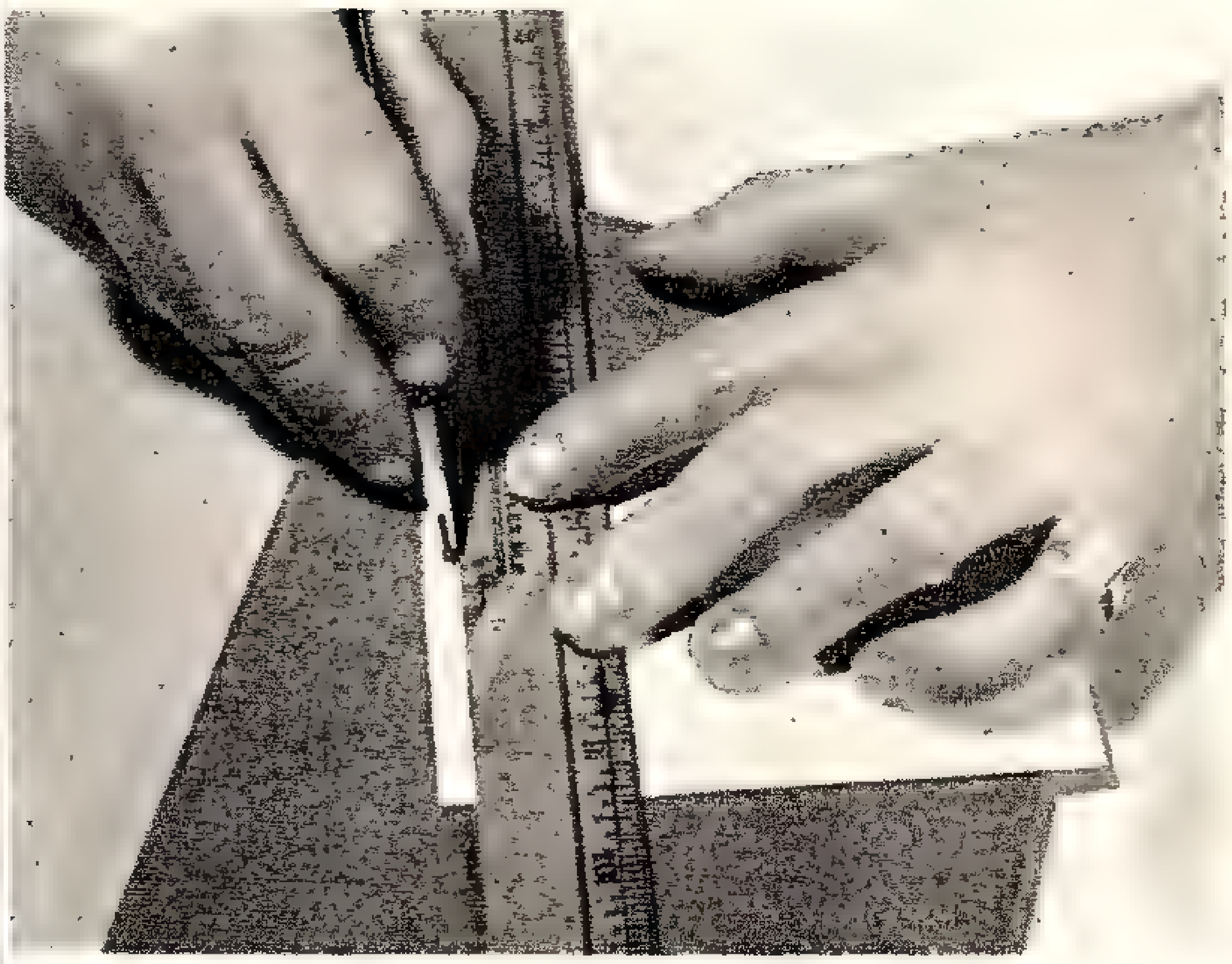
[*Continued on page* 120]

KINKS FOR



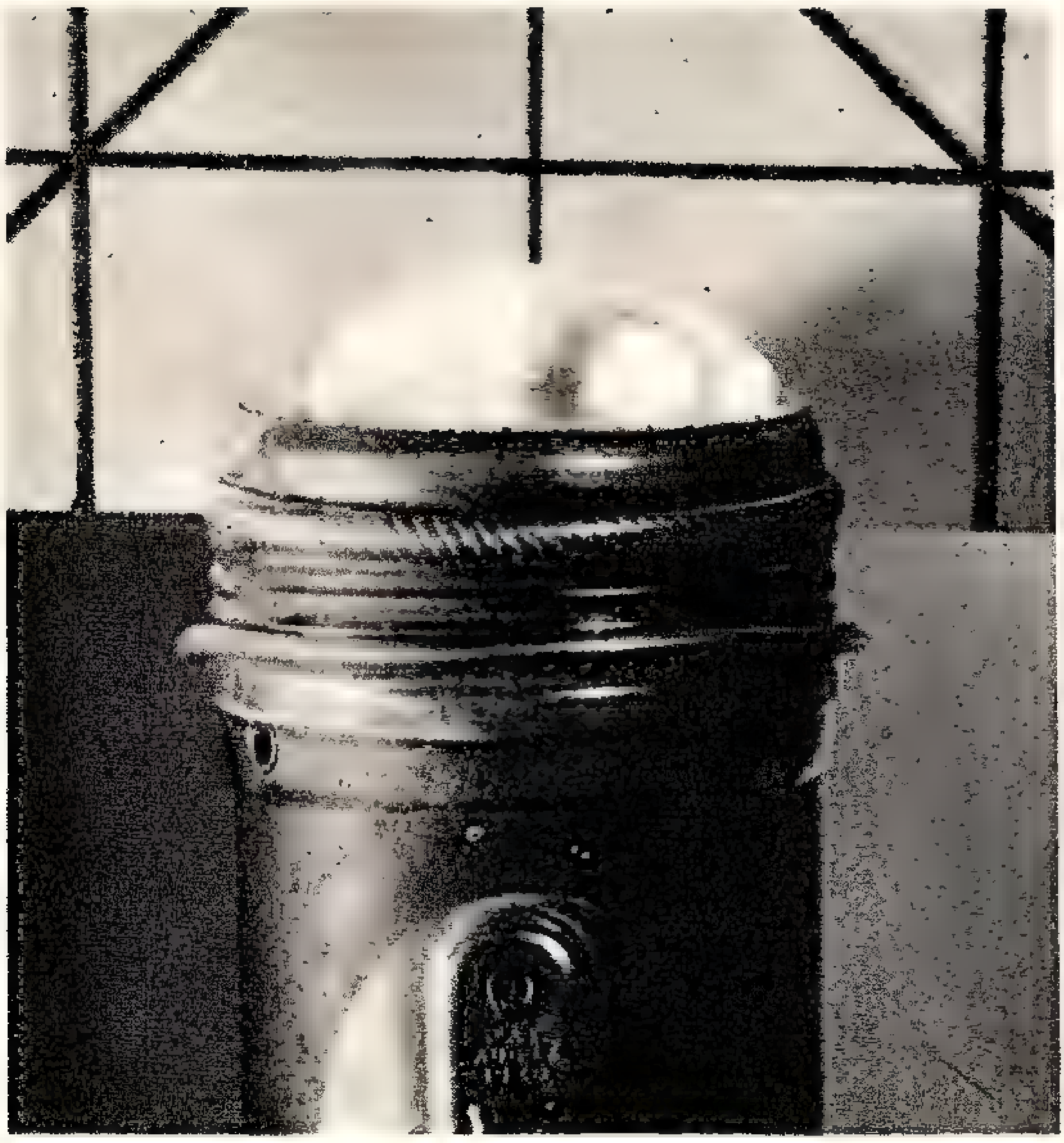
SPRING SPEEDS CUTTER

When trimming prints, the cutter blade action can be speeded up considerably by using a spring to raise the blade, as shown in the photograph.



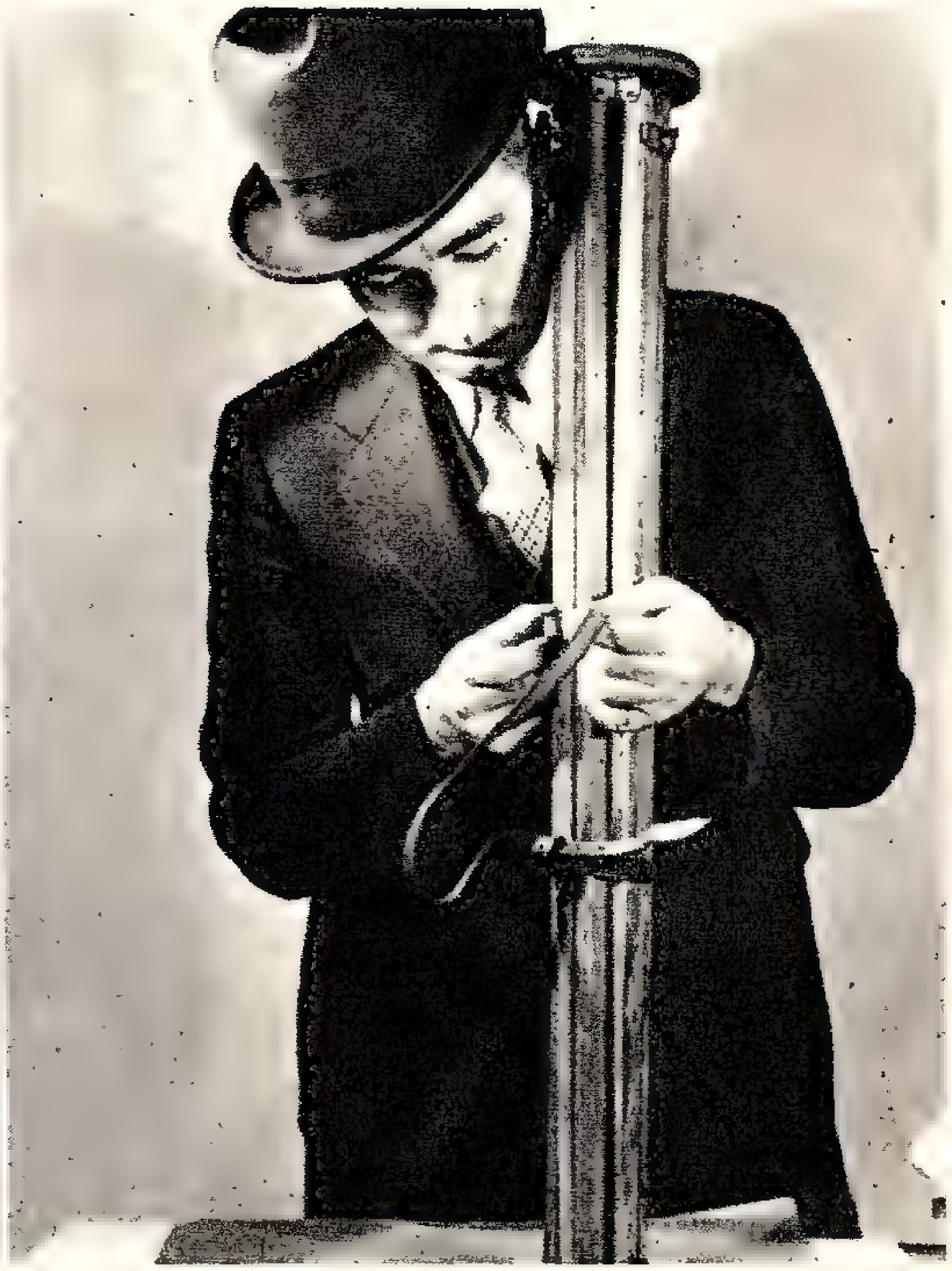
GLASS CUTTER EMBOSSES PRINTS

An ordinary glass cutter supplies a convenient method of embossing the border of prints. Do not apply too much pressure to the cutter.



CARD SIMPLIFIES FOCUSING

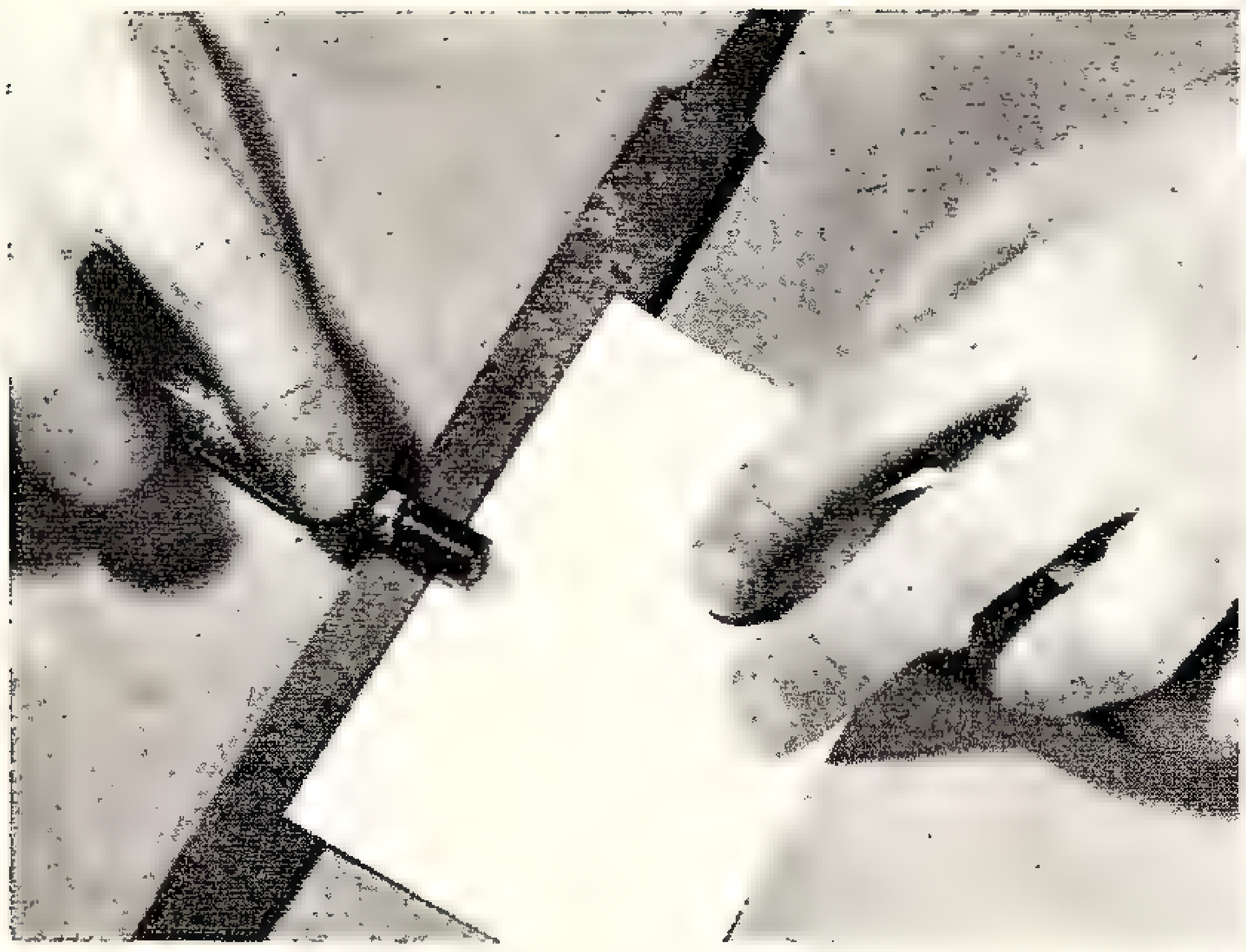
A white card ruled with black lines as shown in the photograph and attached to a flashlight, simplifies focusing when a ground glass is used.



STRAP HOLDS TRIPOD

A book strap fastened to the tripod as shown in the photograph becomes a convenient handle. It then can be carried like a suitcase.

CAMERA FANS



FILE DECORATES BORDER

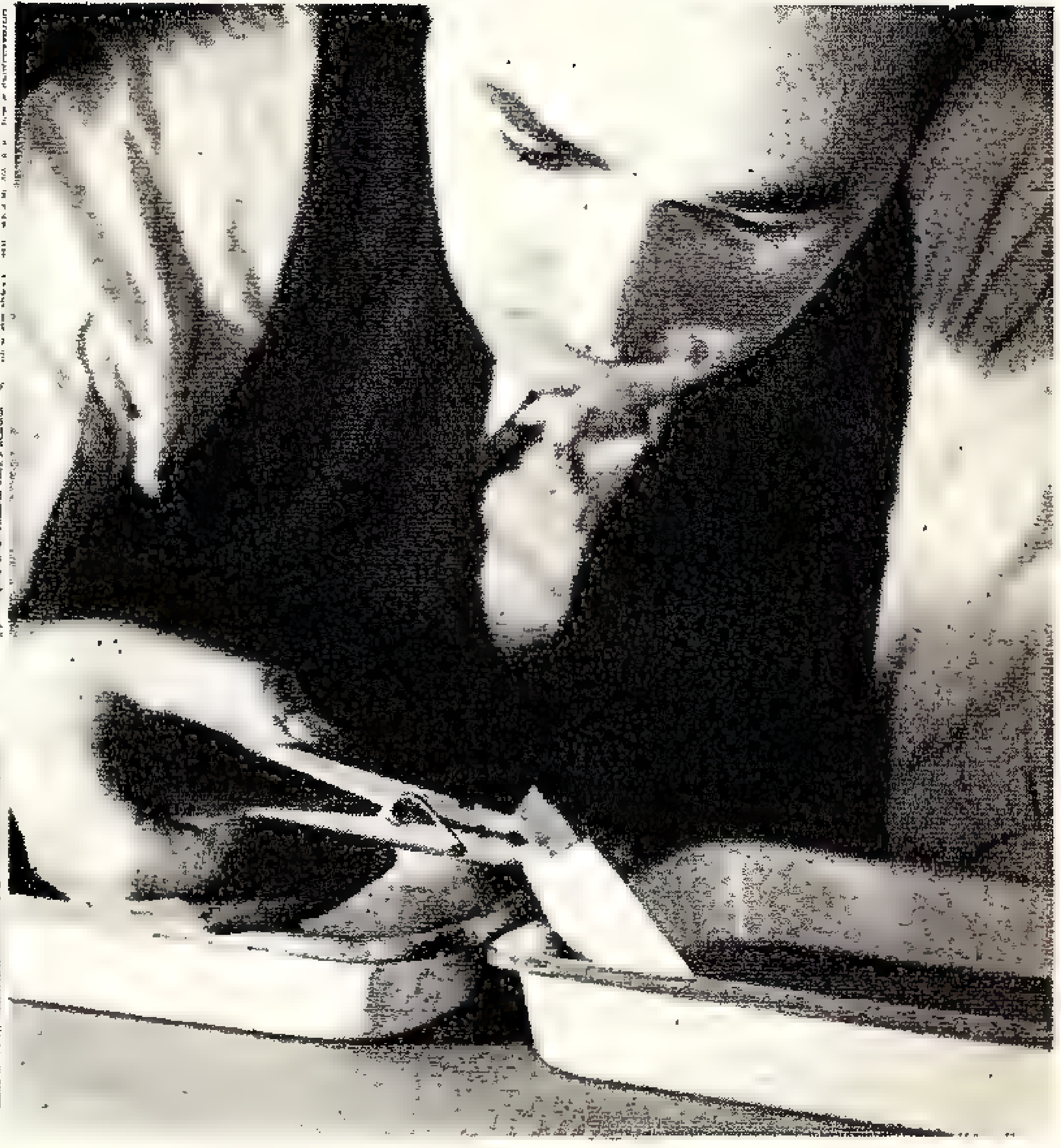
A raised design on the border of prints can be obtained by placing the edge of the print on a file and rubbing the paper with a hard object.

STRING AIDS PAPER REMOVAL

A piece of string fastened to the top of the box containing printing paper, and passed under the pile, simplifies removal of one sheet at a time.

CAMERA IDENTIFICATION

By fastening a piece of adhesive tape on which is printed the name and address of the owner, to the inside of a camera. it can be identified if lost.



TONGS MADE FROM CLOTHES PINS

By sharpening the points of spring clothes pins, they can be used as print tongs. An ordinary file or sanding wheel quickly shapes the required points.

PORTABLE SAFELIGHT

IT FREQUENTLY is necessary in the darkroom to look for something on a shelf or under a table, and because sensitized paper or negatives are in the open, the room light cannot be turned on. An ordinary flashlight fitted with a red filter will prove valuable under these circumstances.

The "filter" consists merely of two layers or common red Cellophane, the kind used for wrapping gift packages. Unscrew the head of the flashlight, remove the lens, and use this as a pattern in cutting the Cellophane, as the photo shows. In reassembling the parts, put the red discs on the inside of the lens, so that they will not be torn when the flashlight is being used.

It is advisable to test this light by letting it shine for about 15 seconds on a piece of film. Develop and look for signs of "fogging."

DEVELOPER HEATERS

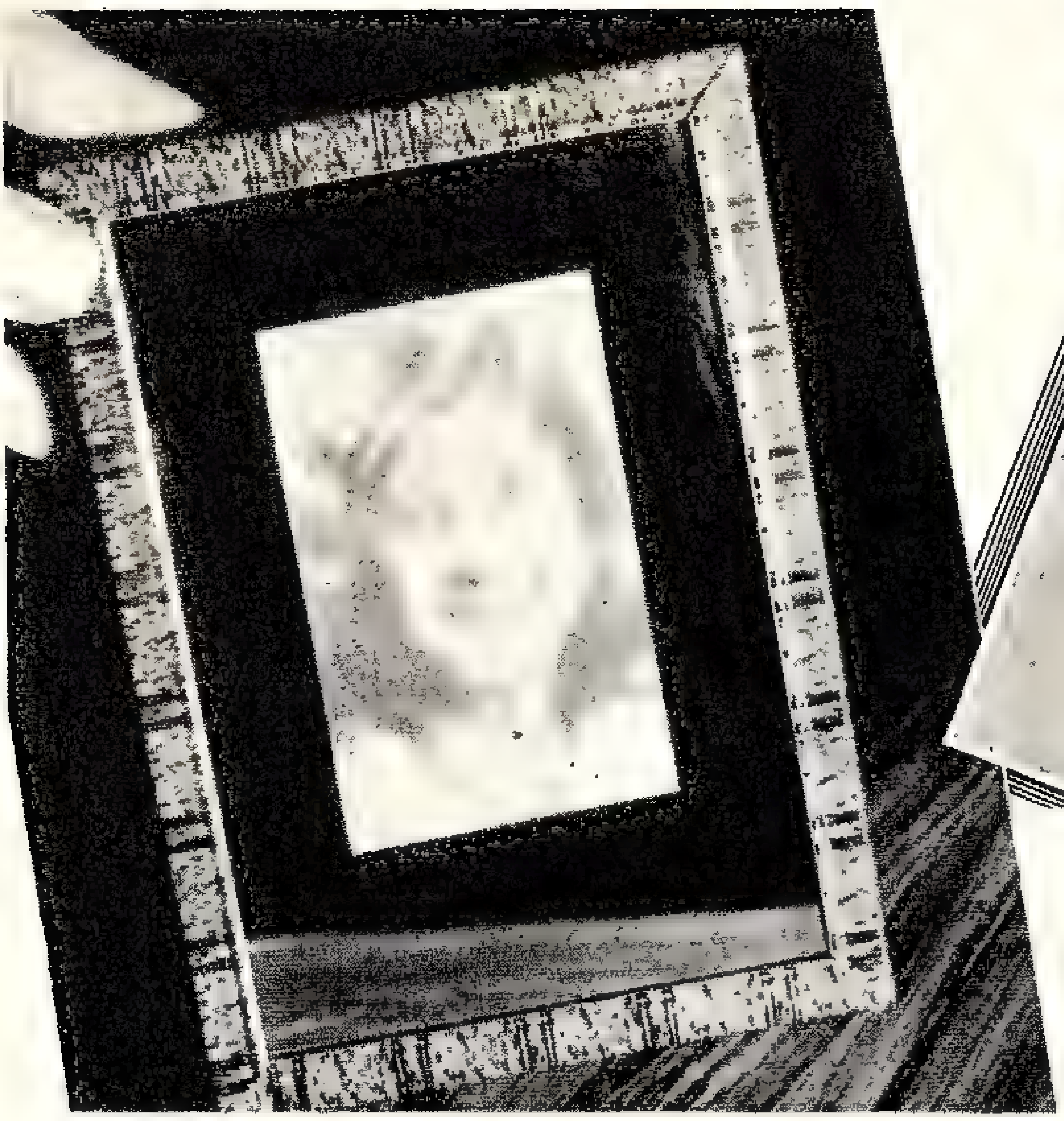
Above: Tray on electric stove. Left: Developer tank with immersion heater.

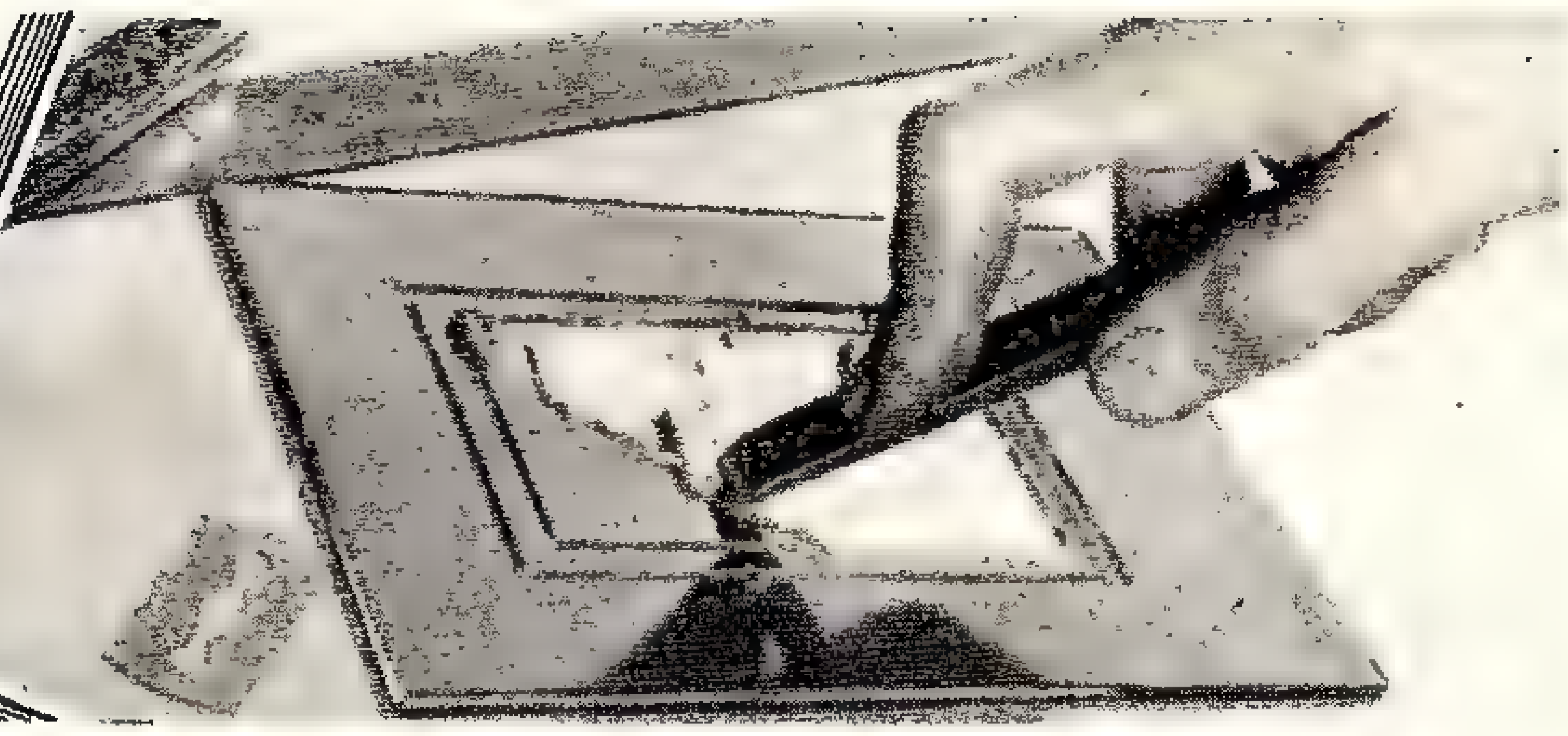
AFTER a spare corner of the cellar was walled in for a darkroom, considerable trouble was experienced by a camera fan in keeping chemicals sufficiently warm during cold weather. Two inexpensive devices found in the house solved the problem.

For print developer trays, an old electric stove that cost only $1.25 new proved perfect. It raises cold developer to 65 degrees in about three minutes. The tray is left on the stove, and the latter is turned on occasionally by means of a push-type line switch to keep the liquid warm. The heat is never needed long enough to damage the enamel on the tray.

Developing tanks for cut film were most easily kept warm by means of an immersion heater originally used for shaving purposes. It was found necessary to tape the top tightly with adhesive tape, to prevent the developer from seeping into the heating unit.

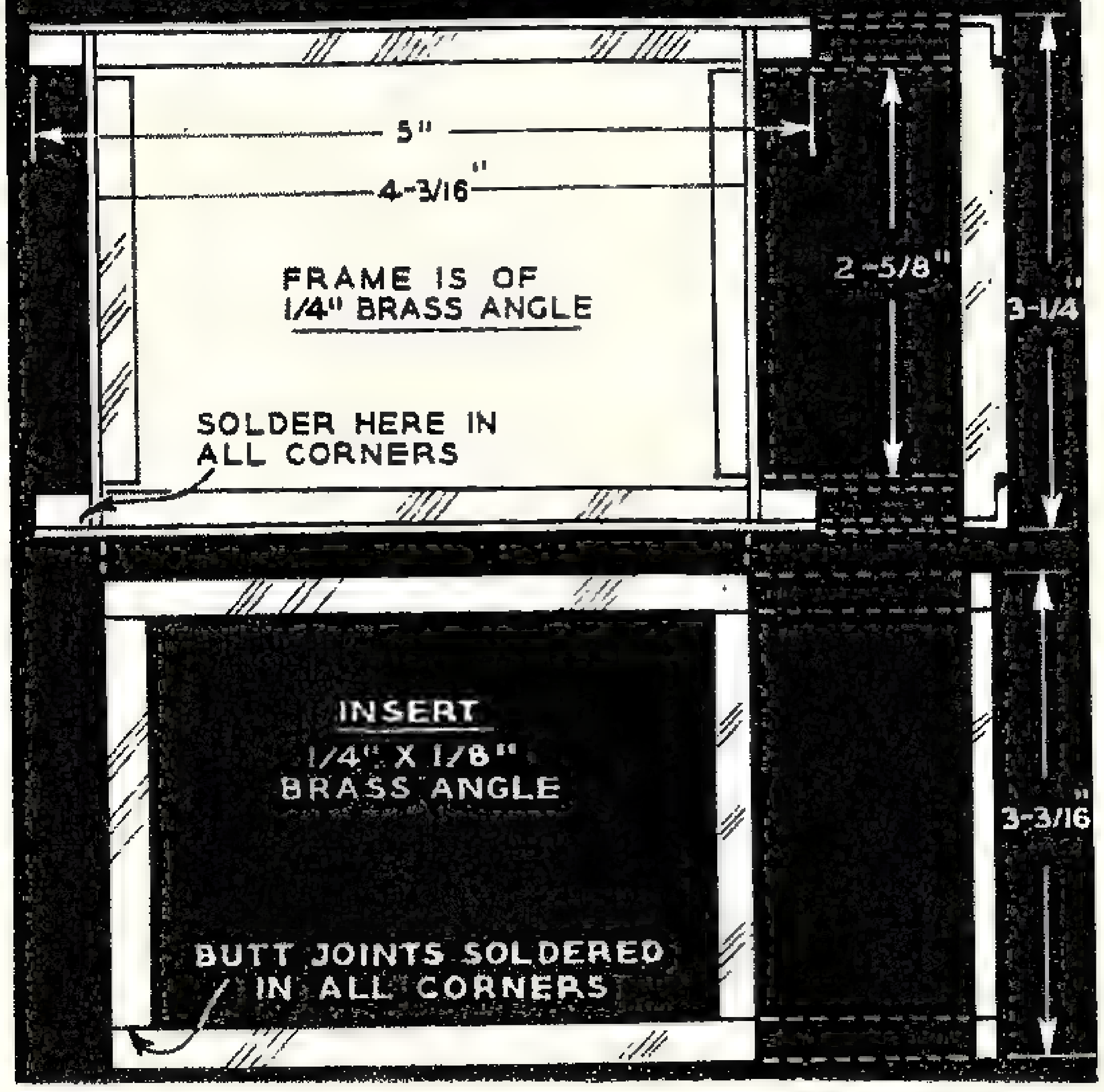
NOVEL MIRROR PICTURE FRAME

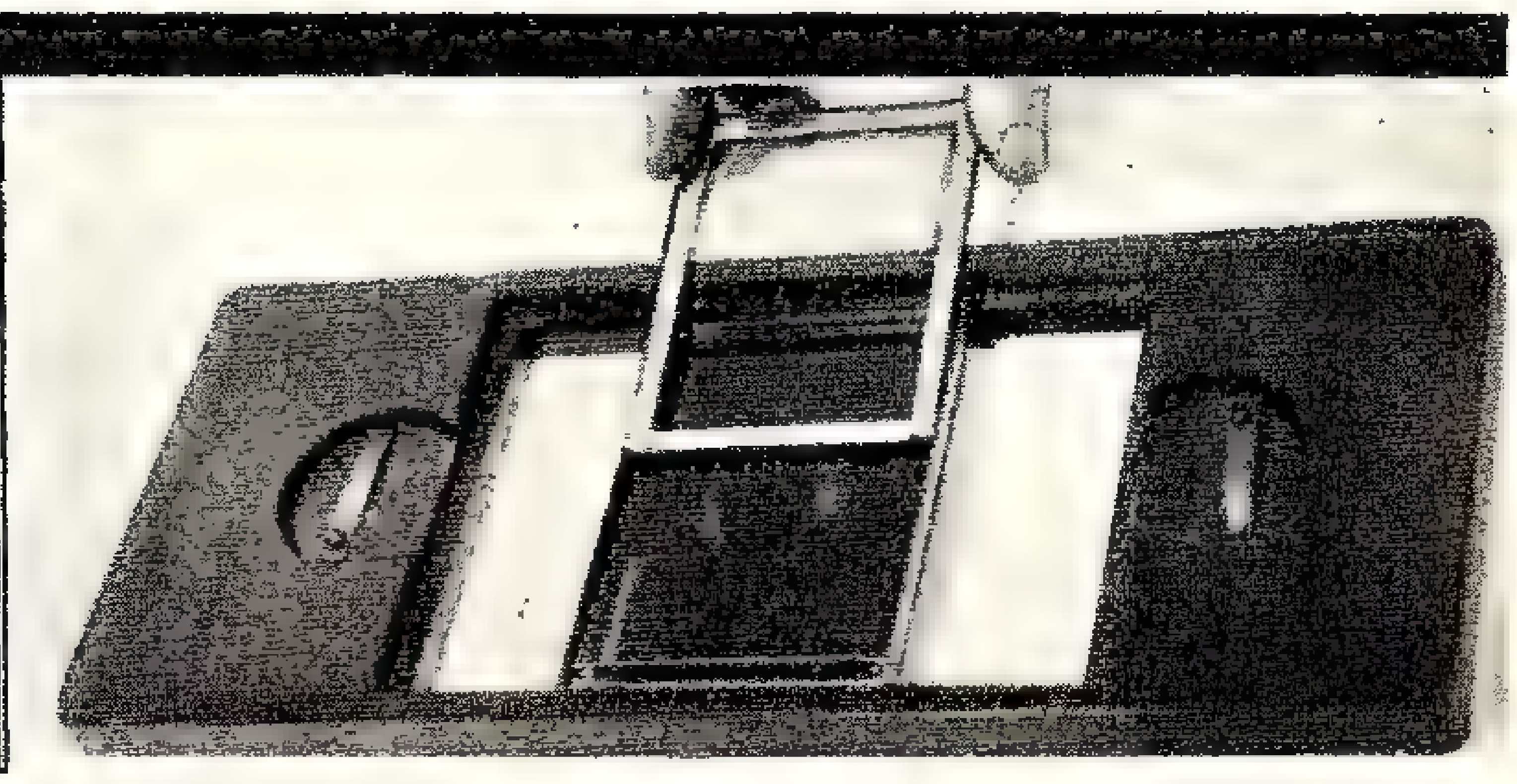




FROM a ten-cent mirror you can make a picture frame that is distinctive and attractive. Remove the backing and the metal or wood surrounding the mirror, and with a pencil mark out the picture opening on the varnish layer that protects the silvering. Around the opening draw any decorative design desired. With a chisel, razor blade or similar tool, remove the silvering and its protective varnish from the picture opening and decorative areas. With black or colored lacquer, paint over the cutaway areas, with the exception of the picture opening. Usually this requires two coats to produce a solid color. When the lacquer is dry, place the picture in position, return the mirror to its original frame or put it in a new one.

GLASSLESS NEGATIVE HOLDER


5"
4-3/16"
FRAME IS OF 1/4" BRASS ANGLE
SOLDER HERE IN ALL CORNERS
2-5/8"
3-1/4"
INSERT 1/4" X 1/8" BRASS ANGLE
3-3/16"
BUTT JOINTS SOLDERED IN ALL CORNERS

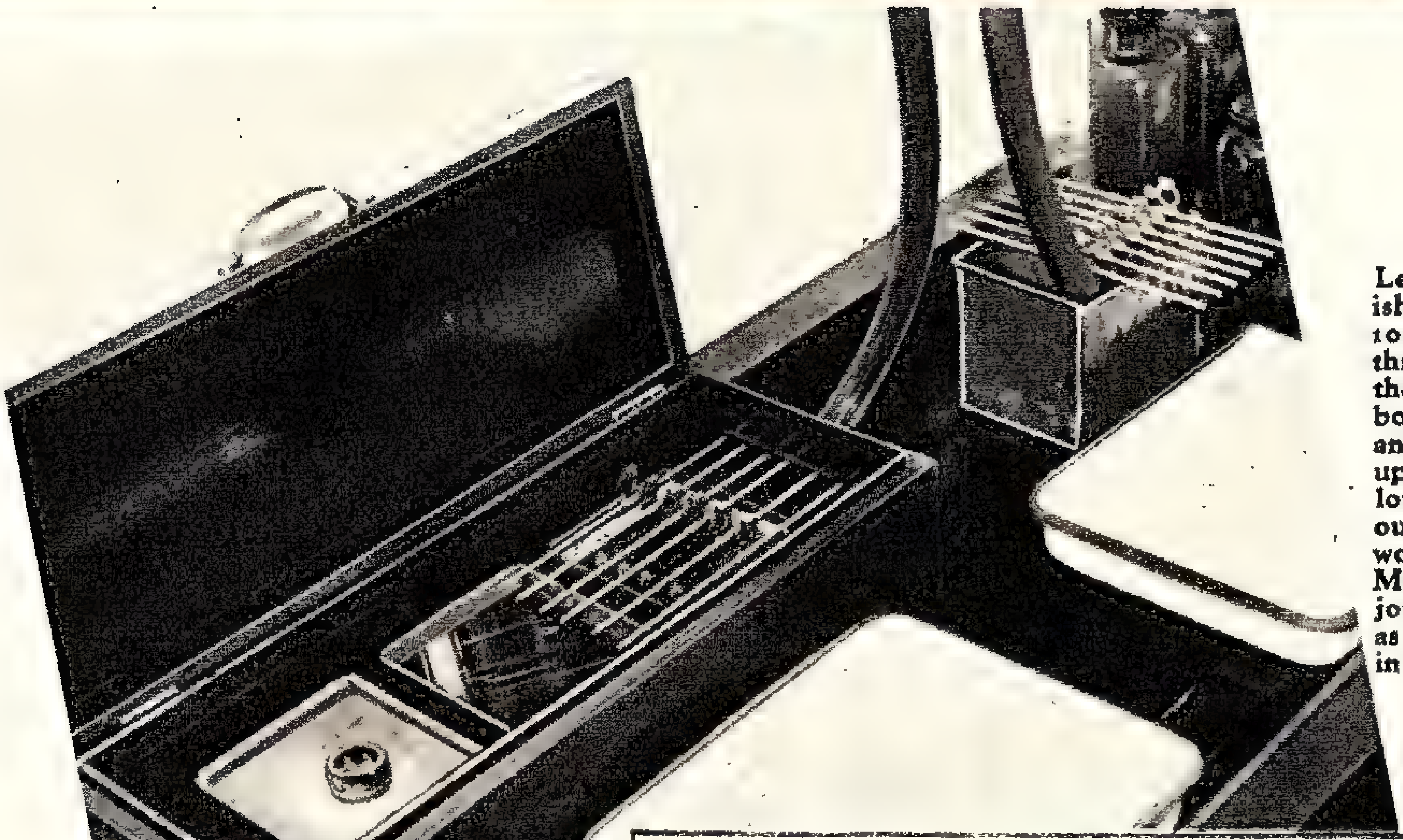


PHOTOGRAPHERS are well acquainted with the disadvantages of making enlargements from negatives enclosed in the usual glass frame-work. Dust and lint must be continually removed from the glass plates if spots on the finished prints are to be avoided. Unfortunately, there is no substitute for this type of holder when using roll-film negatives and large cut-film negatives because of the constant danger of buckling. However, with cut film in the smaller sizes, from 2¼"x3¼" to 4"x5", the glass-less holder illustrated here has been found entirely practicable. Hardly any buckling is noticeable, and the problem of dust and lint is reduced to the absolute minimum.

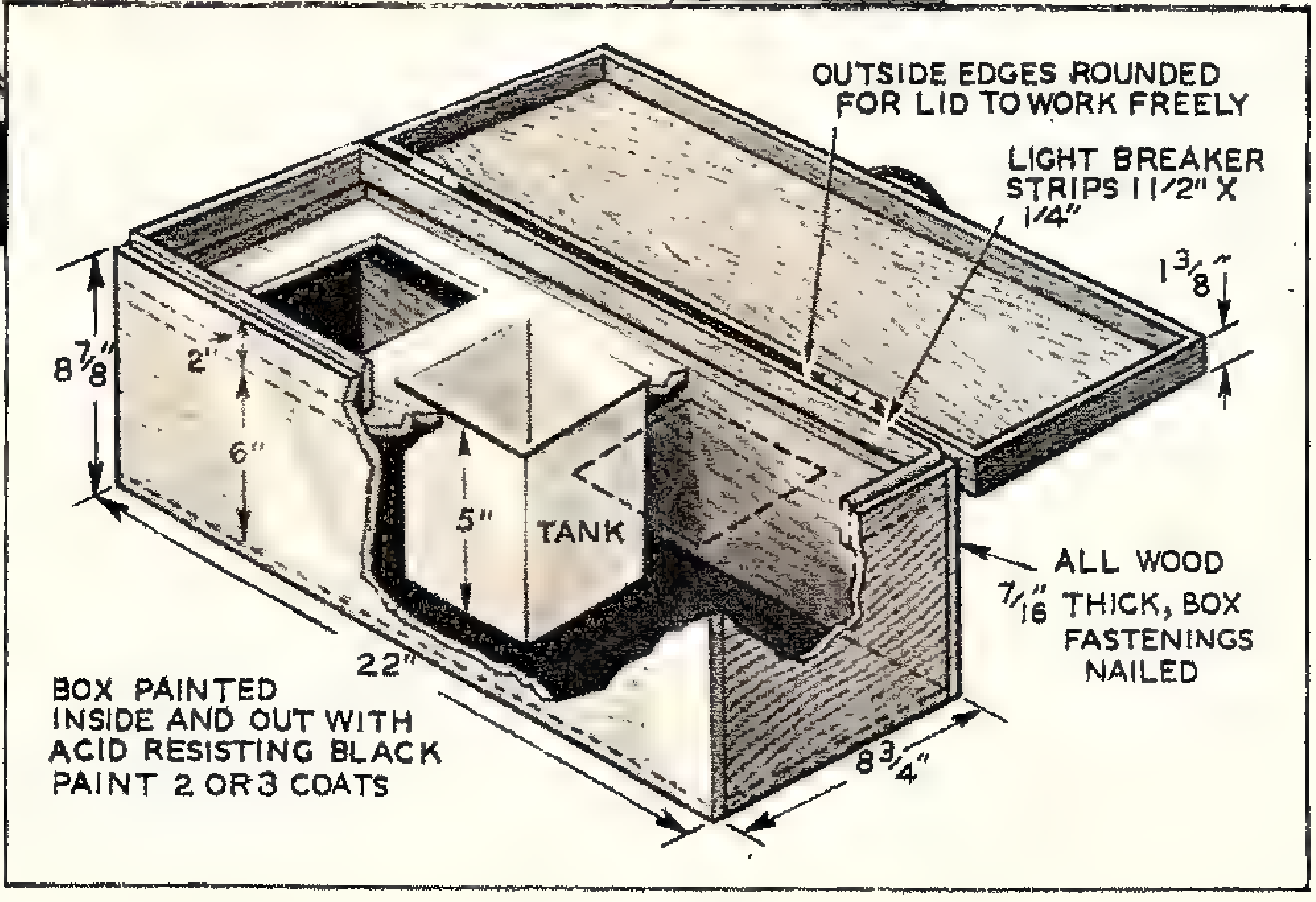
Such a holder for 3¼"x4¼" film is shown here. The longer sections of the frame should fit snugly in the enlarger slide.

DEVELOPING OUTFIT FOR CUT FILM

by Keith Swanson



Left—Set-up of the finished box in the darkroom. Water runs in through one pipe at the right end of the box, and out through another pipe in the upper left corner. Below—This developing outfit is a very simple wood-working project. Minor leakage at the joints is not important, as the box is kept in a sink anyway.


OUTSIDE EDGES ROUNDED FOR LID TO WORK FREELY
LIGHT BREAKER STRIPS 1 1/2" X 1/4"
1 3/8"
8 7/8"
2"
6"
5"
TANK
22"
ALL WOOD 7/16" THICK, BOX FASTENINGS NAILED
BOX PAINTED INSIDE AND OUT WITH ACID RESISTING BLACK PAINT 2 OR 3 COATS
8 3/4"

HERE is a developing box that will make your film developing hours a pleasure. Besides being a decided convenience, it will put your negative making on a systematic basis, with the result: BETTER NEGATIVES!

To have perfect negatives from the developing angle, we must develop at the correct temperature for the correct length of time, all the time handling our negatives carefully to avoid any accidental scratches. A system such as here described will pay for the time and effort put into its construction if it saves one negative from accidental ruin.

The box is made of wood and contains three metal developing boxes for three solutions: the developer, the chrome alum hardening and stop bath, and the hypo bath. These three tanks are supported upon a wood subpanel so that water may flow around the tanks for cooling purposes. A hinged lid, in conjunction with lightbreaker strips, makes the inside of the box absolutely dark when the lid is down. Thus, after placing of the film in the developer, and the lid closed, the darkroom lights may be turned on and other work done while the negatives develop and fix. Regular Kodak film developing hangers are used, which, when used with the No. 1 developing box, will handle any cut film size up to 4x5 inches.

To complete the negative making, another developing box is used for washing purposes. The setup in the writer's darkroom is shown in the photo. If the darkroom is in a cellar and tends to be cold, warm water can be circulated in the box to keep the solutions at the proper temperature.

THIS YEAR
. . . YOU CAN OWN AN
EVINRUDE
FOR AS LITTLE AS
$47.50
EVINRUDE
BOAT and MOTOR SELECTOR
BOAT GUIDE
Elto
EVINRUDE 1938

THIS YEAR, an Evinrude for only $47.50 . . . *and what an Evinrude!* Weighs no more than a fair-sized string of fish! Drives a boat 20 miles for the price of a pack of cigarettes! Sleekly modern, with Hooded Power, finger-tip controls, underwater silencing . . . easy to start and sheer pleasure to handle!

Write for free catalog of the Ranger and seven other advanced Evinrude models . . . a motor for every type of boat and service!

• AN ELTO FOR AS LITTLE AS $37.50

Quality at low cost . . . Elto offers it in 4 outstanding models priced as low as $37.50. Every Elto is *built by Evinrude*, to Evinrude quality standards. *Evinrude and Elto models are available on easy time payments!* Mail coupon for catalogs.

EVINRUDE MOTORS
5455 N. 27th Street Milwaukee, Wis.
In Canada, Evinrude Motors of Canada, Peterboro, Canada

PRICES F. O. B. FACTORY MILWAUKEE

NEW EVINRUDE Ranger $47.50

Full Streamflow Hooded Power design with Co-Pilot steering and finger tip controls. Weighs only 16 lbs. Offers the overshadowing convenience of three-hour cruising range—longest ever offered in an outboard. Develops 1.1 N.O.A. certified brake H.P. at 3750 R.P.M

SPORTSMAN
New Simplex Starter model, $69.50.
Cord starting model, $59.50.

SPORTWIN
New Simplex Starter model, $92.50.
Cord starting model, $82.50

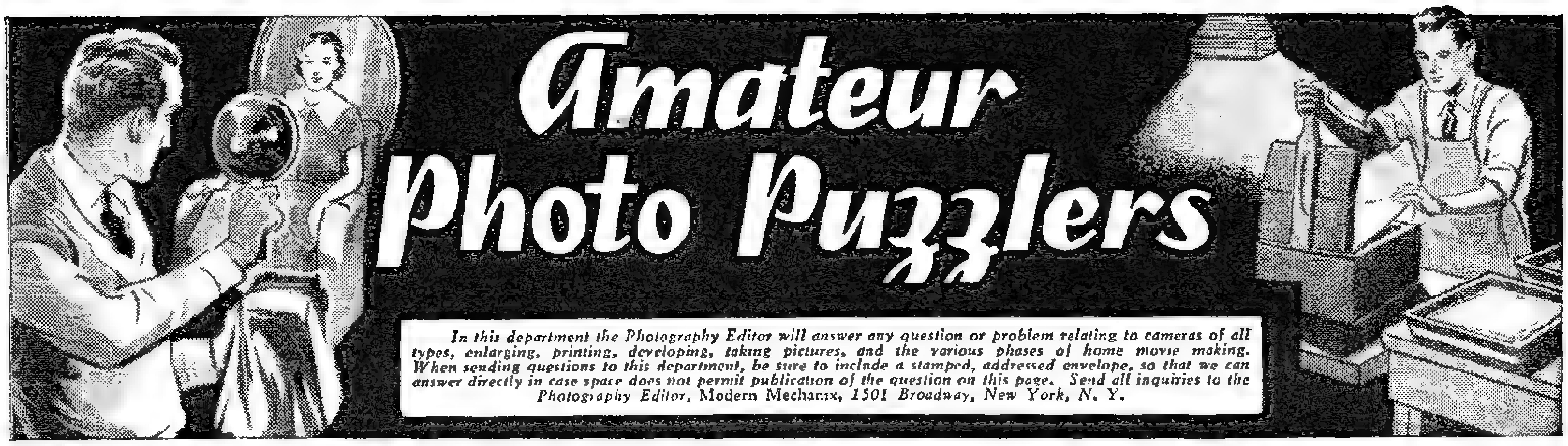
MAIL COUPON FOR FREE CATALOGS

With these handsomely illustrated Evinrude and Elto catalogs we will send *Boat Guide* of leading builders and handy new *Boat & Motor Selector.* All Free! Mail coupon now!

EVINRUDE MOTORS, 5455 N. 27th St., Milwaukee
Send free catalogs, Boat Guide and Selector

Name ....

Address ....



Amateur Photo Puzzlers

In this department the Photography Editor will answer any question or problem relating to cameras of all types, enlarging, printing, developing, taking pictures, and the various phases of home movie making. When sending questions to this department, be sure to include a stamped, addressed envelope, so that we can answer directly in case space does not permit publication of the question on this page. Send all inquiries to the Photography Editor, Modern Mechanix, 1501 Broadway, New York, N. Y.

THE MM ENLARGER

The MODERN MECHANIX enlarger described in the March issue has proved very popular with readers. The only part of the construction that seemed to cause any trouble at all was the rheostat. The drawings were perfectly clear, but evidently the 1000-ohm coil of nichrome wire called for in the description is not available in many parts of the country. This rheostat can be dispensed with altogether and replaced by a second photoflood bulb connected in series with the bulb in the enlarger itself; directly across the terminals of this second bulb, connect an ordinary single-pole, single-throw snap switch. The extra bulb should be mounted under the enlarger table and enclosed in a light-tight box of plywood or tin. When focusing with the enlarger, keep the snap switch open. This places the two bulbs in series and makes both of them burn with the approximate intensity of an ordinary 60-watt lamp. The enlarger head thus remains cool. After the image on the enlarger easel has been focused and framed correctly and an exposure is to be made on a sheet of paper, simply snap the switch closed. This short-circuits the second photoflood bulb and causes the bulb in the enlarger to come up to full brilliancy. Incidentally, this arrangement will greatly increase the life of the photoflood bulbs beyond their rated two hours.

Judging from the correspondence the enlarger article produced, there must be thousands of old lenses in attic and cellar junk boxes. As the article stated, any lens of at least 5¼" focal length can be used. However, the focusing arrangement does not permit the use of very long focal length lenses such as made for old-time 5x7 and 8x10 view cameras. The limit is a 6½" lens. The actual speed of the lens is of comparatively little importance, as is the condition of the shutter mechanism. In fact, a shutter is not required at all and if an available lens of suitable focal length happens to have one, simply set it for time and leave it open. A lens having a speed as slow as f.8 will be found quite satisfactory; of course, faster lenses up to f.4.5 or f.3.5 will permit shorter exposures to be made, especially with dense, over-exposed negatives.

EXPOSURE IN ENLARGING OPERATIONS

Many inquiries are received by the photography editor about the length of exposure necessary in enlarging operations. It is utterly impossible to give any specific figures for any particular enlarger, as the exposure time depends on all of the following factors: the density of the negative, the speed of the lens, the degree of magnification, the type of enlarging paper and the type of developer. Photographers who are just beginning to do their own processing should carefully study the article on pages 104, 105 and 106 of the April, 1938 issue of MODERN MECHANIX. (This also appears in the new PHOTOGRAPHY HANDBOOK). This article describes the approved method of making test strips to determine correct exposure.

USING HYPO

A question that pops up in the photography mail every day is this: "Can the same hypo solution be used for both negatives and prints, or is it desirable to have separate bottles?"

The answer is simple. The same hypo can be used, provided the developer is a non-staining type. The only developer of this kind still in general use is known as "pyro" and is found only in darkrooms of commercial photographers. Practically all present-day developers of the fine grain type are non-staining in action.

It is highly advisable to filter the hypo solution after it has been used with negatives and before it is used with prints. This filtering can be done through a wad of ordinary absorbent cotton, placed in the neck of a glass or enamel funnel.

CUT FILM IN PLATE HOLDERS

I picked up an old 4x5 plate camera in very good condition at a very low price. A number of holders intended for glass plates came with the outfit. I do not want to use glass plates, because of their weight and fragility. Is there any way of revamping these holders so as to make them take cut film?—J. P., Chicago, Ill.

No revamping of any kind is necessary. You can buy cut film sheaths made especially for this purpose. These are simply stiff pieces of metal with rolled up lips to accommodate the cut film. The whole sheath is then slipped into the plate holder, just as if it were a glass plate.

DEVELOPING OLD FILM

In cleaning out a desk drawer, I came across a roll of film taken about two years ago but never developed. Do you think it worth while to have this processed?—G. C., Flushing, New York.

By all means have the roll developed. Films have been known to retain their images for many years.

DIFFUSING SCREEN

What materials do you recommend for use as diffusing screens in front of floodlights using the small size photoflood bulbs? I have tried tracing cloth, but it seems to cut the light down quite a lot.—A. H., Bronx, N. Y.

Any diffusing screen will reduce the effective illumination to some extent. Tracing cloth is widely used because it is tough and can be rolled and unrolled easily. Ordinary tracing paper is also good, but only for temporary use. Thin silk is excellent. A large handkerchief makes a serviceable diffuser, as its bound edges resist tearing. In all cases it is advisable to mount the diffusing screen a few inches in front of the bulbs, to avoid danger of fire and to provide free circulation of air.

SELF-TIMER FOR CAMERA SHUTTER

I would like to make pictures of my shop, but I'd like to be in them. I've tried long strings attached to the shutter and other stunts, but they haven't worked so well. Can you suggest anything in this regard?—J. L., Lawrence, Mass.

What you want is a self-timing attachment, to fit the cable release of your shutter. There are two types: one works by delayed spring-action, the other by air-compression release. Both are satisfactory. You can buy them from any camera supply firm. The "delay" action is adjustable up to about one minute, giving you plenty of time to get into the picture before the exposure is made.

MODERN MECHANIX AWARDS $40 EACH MONTH FOR BEST PHOTOS SUBMITTED BY READERS

The editors of Modern Mechanix distribute $40 in cash awards each month to the five persons who, in their opinion, submit the best pictures suitable for publication in the Modern Mechanix Photography section. Full particulars regarding these awards will be found in this issue on page 103.

Cosmic Ray Dynamo Theory Advanced By Scientist

Where do cosmic rays come from? What is the source of their enormous speed? Continually raining upon the earth from "somewhere outside," these fast-flying bits of electricity form a real brain teaser for scientists. For nothing which moves as fast has yet been created by earthly means.

To say that cosmic rays come from giant electrical dynamos in the heavens sounds a bit naive, doesn't it? Stated in those words it reminds one of the hypothesis that the planets revolve about the sun on (invisible) spokes. But when put in the precise language of physics the "cosmic dynamo" theory is quite sound and has been suggested recently by a Swedish physicist, Prof. Hannes Alfven of Uppsala University.

The rain of electricity from the cosmos, and the current of electricity running through your lamp, attain their energy in very much the same way, according to this scientist's picture. Both derive their power from whirling magnets.

Have you ever watched the giant machines in an electrical power plant? One marvels at man's ability to create these harnessed monsters which supply his vital needs of heat, light and power. Ponderous whirling magnets, driven by high pressure steam or by the fall of water, force particles of electricity to stream through wires and serve us at every turn of our material life.

To jump from the power plant to whirling magnets in the heavens may seem a bit fantastic, but such a jump was made by the Swedish physicist (although he doesn't say so) with perfectly good scientific justification. For, like our own earth, stars are known to be magnets. And the very same electrical reasoning which applies to dynamos in power houses applies to the inconceivably huge heavenly bodies spinning forever in the immensity of space.

The double star is a type of cosmic dynamo which Prof. Alfven discusses. Two stars revolving about each other can generate as much as a million million volts according to his calculations. This enormous voltage exists in a region of space between the stars. Electrical particles (cosmic rays?) which happen to be in this region are thrown out with speeds practically equal to that of light.

NOTICE

Changes in the make-up and title of this magazine, designed to make your favorite publication better than ever before, will become effective with our next issue. Be sure and reserve your copy now. Our new name will be—"MECHANIX ILLUSTRATED."

DU PONT
DUCO
7
POLISH
SPEED BLEND
For Duco, Dulux & Synthetic Enamels

"POLISHING'S A CINCH with DU PONT POLISH"

Now you'll find it easier, quicker than ever to make your car mirror-bright. A little brisk rubbing with Du Pont No. 7 Polish, and your car sparkles like new. No. 7 Polish is made by Du Pont, world's largest maker of modern car finishes. That's your assurance it's right for the finish on *your* car.

DU PONT

Sample for You! Send 6¢, part mailing cost, for sample can of No. 7—enough for fenders and hood. (Offer good in U. S. only.) Write Du Pont, Dept. MM-1, Wilmington, Del.

Always ask for

DU PONT POLISH

This Sidewalk Runabout

[*Continued from page* 75]

down on a lathe, as in Fig. 11. This of course requires a pattern. Another very satisfactory wheel used by the writer for several small power vehicles is a 3-inch by 12-inch disk with balloon tire. It is assembled with six small bolts through the hub, and by substituting longer ones for these, a combination brake-drum and drive pulley can be bolted securely to the wheel. A spacing ring will be necessary to hold the drum away from the tire, as illustrated in Fig. 11.

The rear wheels turn on a stationary steel axle. This is secured to the wooden cross-member at rear of frame by means of J-bolts, simply a ¼-inch carriage bolt with the head cut off and the end bent as shown in Fig. 6. Steering knuckles and a built-up axle are used on the front end, Fig. 9. Construction of these parts requires welding, bending and drilling only, and the wheel spindle must be turned to accommodate the standard wheel bearings.

Figs. 4 & 5 show the complete chassis assembly. The sills or stringers are 1½x2-inch oak, with 2x4-inch oak cross-members where indicated. The chassis is 4 inches wider at back than in front. After the front axle is bolted to the sills, a pipe nipple socket for the bottom end of the steering post is installed. A plywood floor is then carried as far as the back of the seat. Upon this is erected a strap iron frame to support the upper end of the steering post as well as hood. The steering wheel may be either a full size auto wheel, or a hardwood rim screwed to a cut-down Model-T spider.

For the hand lever a pipe, bar or section of seamless steel tubing is bent to a right angle and carried in a pair of bearings screwed under the sills, as shown in Fig. 4. An arm is welded onto the lever for attaching the brake cables and a yoke and link connect the lever with the idler pulley assembly.

Fender bars protect the rear wheels, and the engine bed is mounted on the rearmost cross-member and one just behind the seat. The brakes consist of brake-lining riveted to a shoe made in the form shown in Fig. 7, which is welded to a sliding bar, carried in a sheet steel guide screwed to the chassis sill. A tension spring holds it away from the brake drum when not applied.

A very satisfactory clutch consists of an idler pulley mounted on a sliding bar as in Fig. 8. This tightens the belt on the drive pulley and starts the little car smoothly. As this type of engine is not arranged for variable speed, no controls are necessary, unless a shorting switch, convenient to the hand while driving, is desired.

Various makes of engines can be used in this car, the drive arrangement being identical. For only one-half horsepower, have your wheel-pulley at least 9 inches in diameter. This will not give any startling speed, but enough power.

Biggest Little Show On Earth

[*Continued from page* 51]

Also, while he boasts the longest neck in the world, he is unable to reach the ground without spreading wide his front legs!

A page from ancient Rome is next, with two handsome chariots, one of them driven by none other than Ben Hur!

Then come colorful figures on horseback, and groups of walking figures—soldiers, clowns, policemen, etc. We quickly discover that the walking figures are mounted on concealed tram-trucks, which gives them the startling lifelike motion. Standing at one end of the arena, watching the horses' heads bobbing up and down and their wide hips swaying, with the drivers' reins swinging back and forth, one is fascinated by the impression of reality created.

Last in the parade is an object without which no circus would be complete—the old steam calliope! Gay in brilliant red, white and gold, it rumbles along, wheezing its spasmodic blasts, while the operator punches away at the pianoforte.

When the parade passes from view, we turn to the Main Show. It is a three-ring affair, and one would have to be Argus-eyed to see half the interesting acts performed by the bare-back riders, the galloping ponies, the contortionists, the Japanese acrobatic troups, the tight-wire and trapeze artists—as they flash back and forth "with the greatest of ease."

The entire show is continuous, so we may stroll around the other tents—the Dressing Tent, for the use of the actors; the Horse Tent, with its collapsible water and feed troughs; the Cook Tent and Commissary, with its stacks of tiny canned goods, its miniature bales and sacks of

[*Continued on page* 127]

U. S. Needs Planes, Men

[*Continued from page* 46]

firing; by dropping thousands of bombs, by air missions peculiarly designed and devised to test by the crucible of stern reality the courage, resourcefulness and training of our fighting airmen.

One of the greatest steps this nation has taken since the war in military effectiveness was the formation of the General Headquarters Air Force and that organization has fulfilled the ardent hopes of its founders. It is small but it is effective; it is undermanned but it is soundly organized, properly staffed and ably led.

In computing the strength of any air force, one can count not only machines in existence, but he must determine how soon other equally effective planes and engines could be produced to make good the recognized high loss rate. What is the state of our aviation industry in this country? It is not as large as that in one or two of the other nations. England, undoubtedly, and Germany certainly have more plane and engine production capacity in being than we have in this country. But here again our quality is superior. We are fortunate in having several well established aviation engine factories, capable of rapid expansion. We have a large number of airplane factories manned by capable engineering staffs and trained executive control. These, too, could be enlarged rapidly.

Our civil aeronautical manufacturing industry has been responsible for placing this country in the lead in the civil aviation field. This leadership is manifested by the most successful air line operation and by the fact that we export more airplane products than any other foreign nation. Also our air liners are favored equipment on many of the leading foreign air lines.

In taking stock of our civil industry and visualizing the rapidity with which it could replace war time plane losses, we must not lose sight of the fact that airplanes and their engines cannot be turned out over night. Contrary to popular conception in some quarters, it takes five years to develop a new airplane type—five years from original conception to quantity production. So, obviously, when war comes we shall be compelled to go into production on types already produced in quantity. Despite this earlier experience on these particular types, it would take more than a year to double the size of our present air force. The length of time it takes to fabricate new planes, plus the fact that air forces are the armed forces first to enter the conflict, make it necessary to have adequate air forces actually in existence on mobilization day.

The United States possesses the raw materials needed in airplane construction in greater abundance than any other nation. This is an asset which is sometimes overlooked in evaluating our air strength and resources.

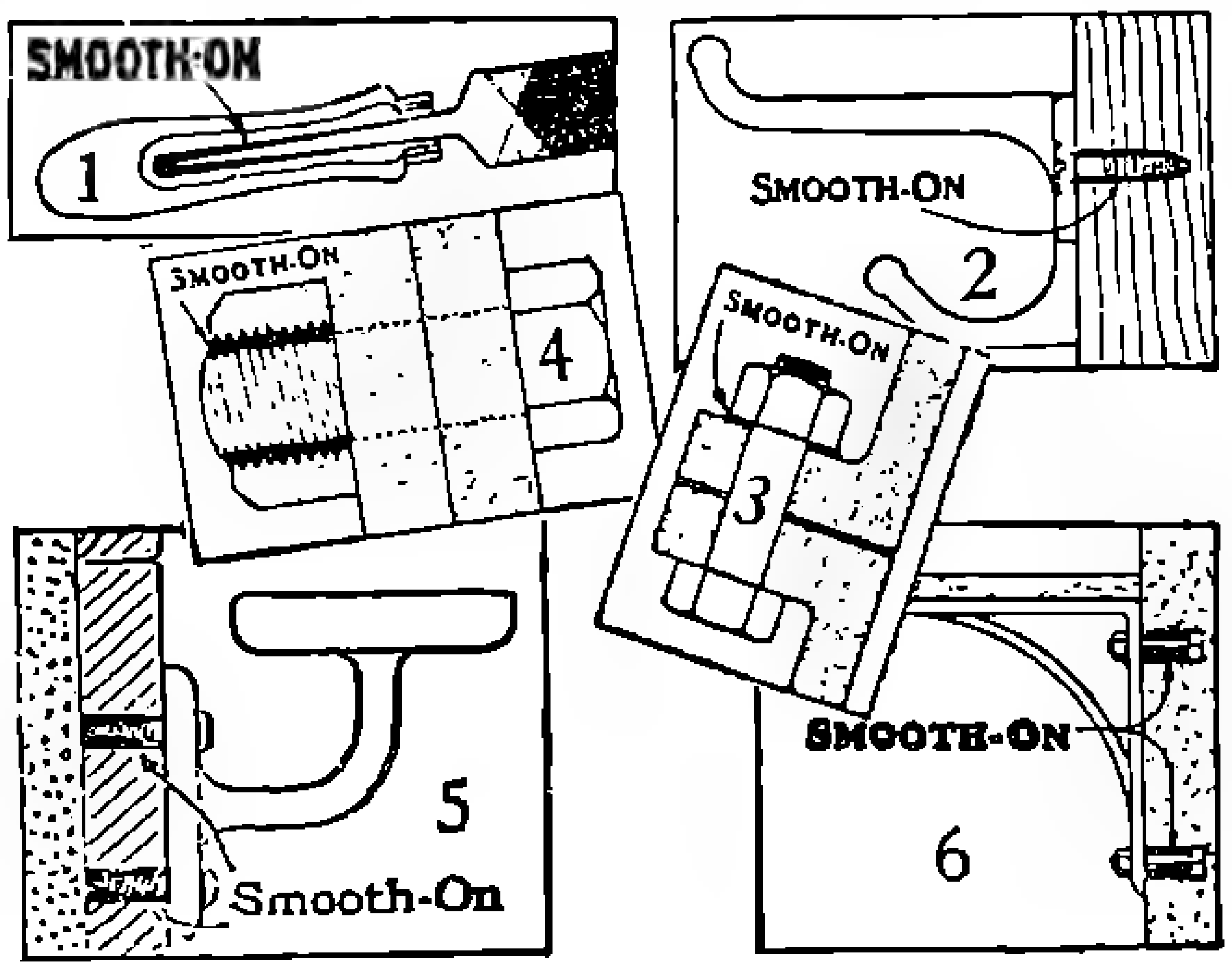
In visualizing our probable missions, our war plans and our geographical locations, a few factors only may be discussed publicly, for obvious reasons. Prominent among these is our much vaunted isolation. Paradoxically, the airplane, which is rapidly destroying our geographical isolation, must be primarily depended upon to provide us continued isolation—to protect us from air invasion. It is now generally recognized that just as armies guard land frontiers and navies protect our sea frontiers, so our Air Corps alone adequately can defend our air frontier. Whereas it is perfectly true that we have friendly neighbors, north and south, and broad oceans east and west, those oceans are rapidly becoming less and less of a barrier to air passage. Then, too, there is no assurance that our sky frontiers may not be menaced by sea based aircraft or by airplanes flown from temporary island bases less distant from our shores.

I agree fully with the Chief of the Air Corps, who recently wrote:

[*Continued on page* 129]

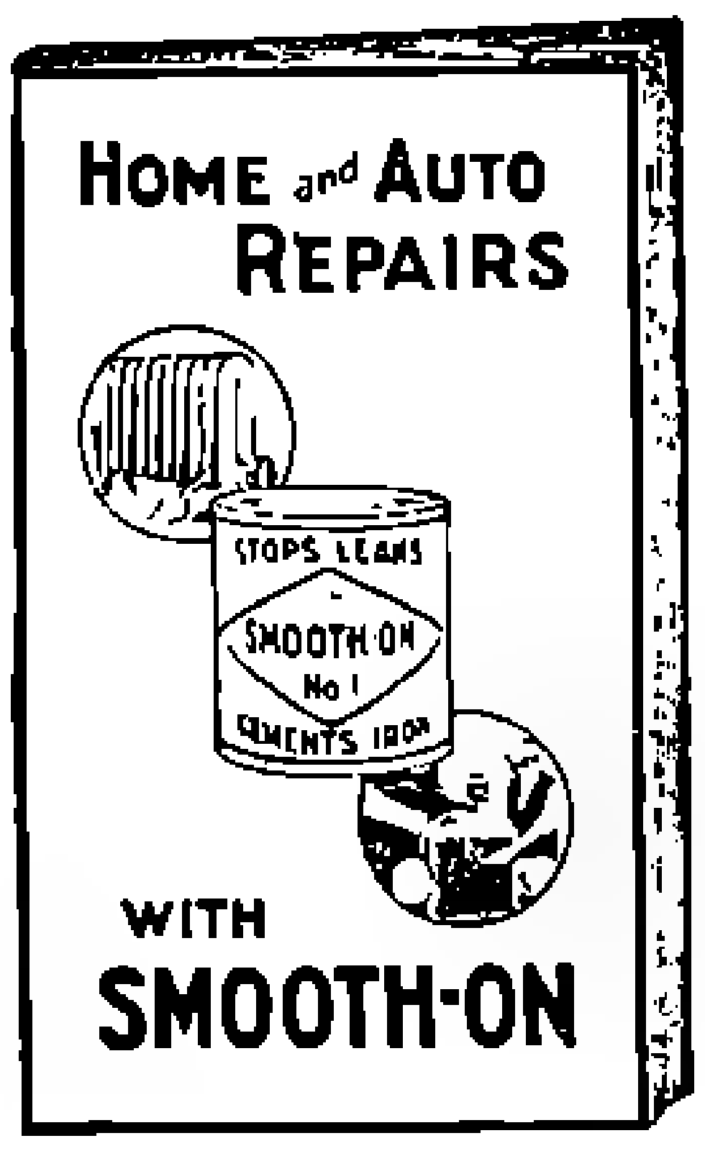
Use SMOOTH-ON No. 1
for tightening and anchoring

Try any one of the following jobs and see for yourself how easily and quickly dependable tightness is produced.



Loose tool and cutlery handles (1):—Fill hole with Smooth-On and force shank in. *Stripped wood screws* (2): —Reset in holes filled with Smooth-On. Excellent for loose hinges, locks, hooks, drawer pulls, etc. *Loose nuts* (3):—Lock by putting Smooth-On between base and seat. Try this on oven handles, etc. *Making oversize threads hold* (4):—Fill annular space with *Smooth-On*. *Anchoring in tile* (5): —Set screws in holes filled with Smooth-On. *Anchoring in concrete* (6):—Chip out hole, insert bolt with head in and fill annular space with Smooth-On. Use nut and washer for fastening attached part. Excellent for holding shelf brackets, cabinets, partitions, etc.

Smooth-On No. 1 is ideal for tightening parts and stopping leaks because of its low cost, its simplicity of application and its unique properties of hardening into metal and expanding while doing so. No heat, special tools or previous experience are required, and judicious use as per instructions in the Smooth-On Home and Auto Repair booklet assure perfect results.

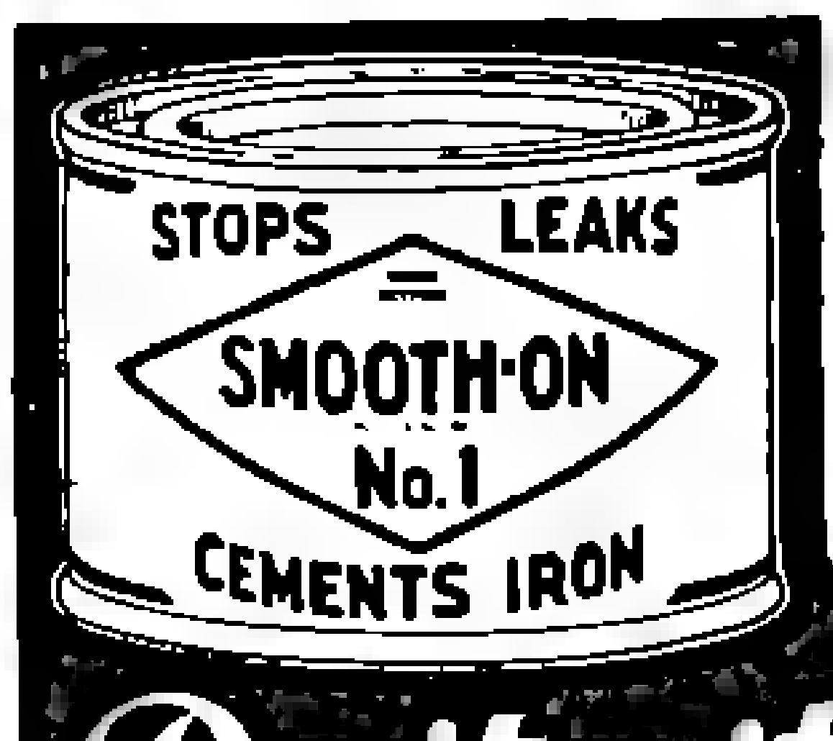


Write for FREE BOOK

If you take pride in doing home tinkering well and like the big savings of time and money, keep a copy of this booklet and a small can of Smooth-On No. 1 in your work bench. The first of many routine or emergency jobs on which you use Smooth-On No. 1 will repay its small cost, possibly many times over.

Mail coupon for the booklet and get Smooth-On No. 1 in 7-oz. or 1 or 5-lb. can from your hardware store or if necessary from us direct.

SMOOTH-ON MFG. CO., Dept. 69
574 Communipaw Ave., Jersey City, N. J.
Please send Smooth-On Home Repair Book.
Name ....
Address ....
5-38 ....



Do it with SMOOTH-ON

CAMERA CATALOG FREE!
SPRING CATALOG 1938 No. 71
WHOLESALE RADIO SERVICE
EVERYTHING YOU NEED IN PHOTOGRAPHY

IT'S out, Camera Fans—new Spring edition of the catalog that saves you REAL money! Latest type cameras, famous names, everything you need in photography at prices you can't beat anywhere! Don't buy that camera until you've seen this valuable FREE catalog. Mail the coupon for your copy today. Camera! Action!

WHOLESALE RADIO SERVICE CO. INC.
NEW YORK, N.Y. • CHICAGO, ILL. • ATLANTA, GA.
100 SIXTH AVENUE 901 W. JACKSON BLVD. 265 PEACHTREE STREET
BOSTON, MASS. • BRONX, N.Y. • NEWARK, N.J. • JAMAICA, L.I.

WHOLESALE RADIO SERVICE CO., INC.
901 W. Jackson Blvd., Chicago • 100 Sixth Ave., New York
(Mail to nearest Warehouse)
Rush NEW FREE Catalog No. 71C-22E8

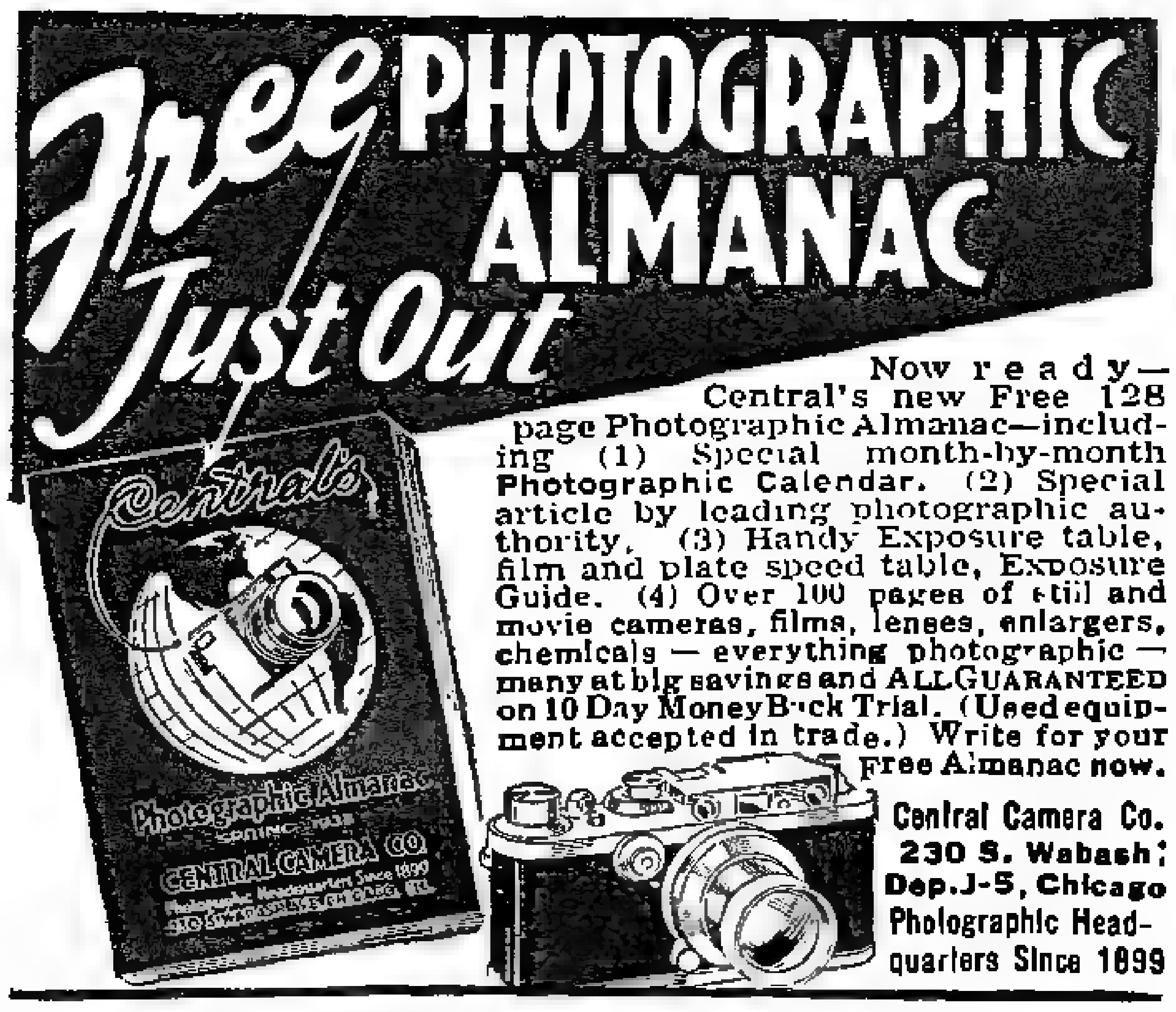
Name..

Address..

City..............................State..............................

RUSH THIS COUPON NOW FOR FREE CAMERA CATALOG

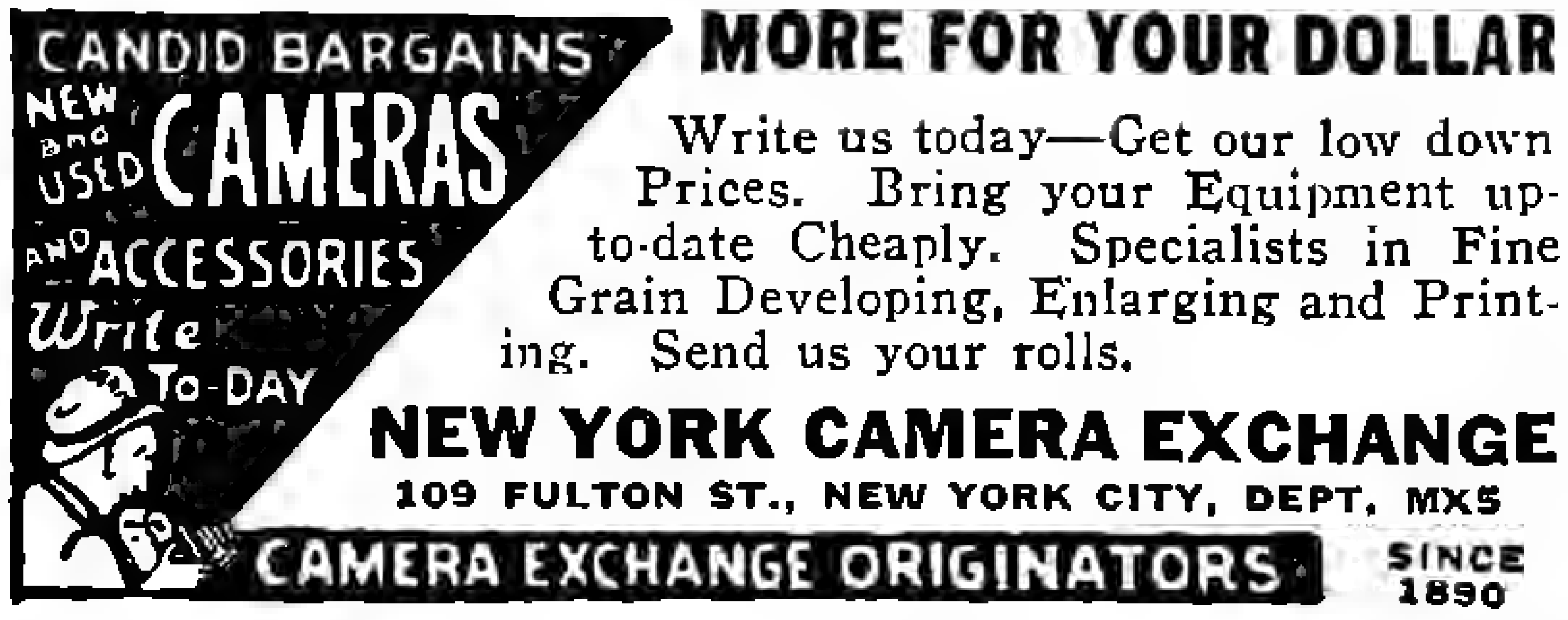
PASTE COUPON ON PENNY POST CARD



Now ready—Central's new Free 128 page Photographic Almanac—including (1) Special month-by-month Photographic Calendar. (2) Special article by leading photographic authority. (3) Handy Exposure table, film and plate speed table, Exposure Guide. (4) Over 100 pages of still and movie cameras, films, lenses, enlargers, chemicals — everything photographic — many at big savings and ALL GUARANTEED on 10 Day Money Back Trial. (Used equipment accepted in trade.) Write for your Free Almanac now.

Central Camera Co.
230 S. Wabash;
Dep.J-5, Chicago
Photographic Headquarters Since 1899

SPORTSMEN'S ANNUAL—1938 EDITION
ORDER YOUR COPY NOW!
148 pages 200 pictures PRICE 50c
At your newsstand, or order from
MODERN MECHANIX PUBLISHING CO.
Fawcett Bldg. Greenwich, Conn.



CANDID BARGAINS
NEW and USED CAMERAS AND ACCESSORIES
Write To-DAY
MORE FOR YOUR DOLLAR

Write us today—Get our low down Prices. Bring your Equipment up-to-date Cheaply. Specialists in Fine Grain Developing, Enlarging and Printing. Send us your rolls.

NEW YORK CAMERA EXCHANGE
109 FULTON ST., NEW YORK CITY, DEPT. MXS
CAMERA EXCHANGE ORIGINATORS
SINCE 1890

The "Tin Can Special"

[*Continued from page* 106]

procedure is used: Lay out the line along which the cut is to be made in pencil. Place a straightedge along this line and make *one firm cut* along this line with a glass-cutting tool. If the line is not clean and complete the first time, it is practically useless to go over it. Then place the glass over a sharp table edge, with the cut away from the edge, and press firmly down. This will give a perfectly smooth and straight break.

If the negative box is made properly, it will fit snugly behind the camera in such a manner that the camera frame overlaps. Before assembling, the inside of the box and the surface of the wooden camera mounting should be painted dull black in order to minimize internal reflections that may cause later trouble.

[*Continued on next page*]

Filter Facts And Factors

[*Continued from page* 109]

scatters green and red light very little, so if the blue light is cut off by means of a yellow filter and the picture taken by the green or combination of green and red light, the haze disappears from the picture and the scene appears sharp and clear.

Since every filter, regardless of its color or depth of color, removes part of the total white light that normally passes through the lens, it naturally follows that the exposure must be increased to produce satisfactory negatives. The number of times the normal exposure must be multiplied to give the correct exposure with the filter is called the "filter factor." For instance, if normal exposure with a given film is 1/10 second at f. 16, and the factor of a filter is 2, the exposure must be doubled; this can be done by leaving the diaphragm at 16 and setting the shut-

[*Continued on page* 125]

Meter Tests Reading Light

[*Continued from page* 102]

metabisulphite for 5 minutes. To make the piece of "tint" paper, lay a scrap of the sensitive paper under a reading lamp that you know, from previous experience or the advice of an electrician, is of normal brightness; or, use a 60-watt bulb at a distance of 3 feet. It will have darkened to the required shade in 2 minutes; then duplicate the tint with water color for the tint that is used over a part of the meter window.

As can be seen from one of the illustrations, the sensitive paper is held against the window with a spring, and turning the lid will bring a fresh section under the window for each test. Reserve discs can be stored in the case.

The "Tin Can Special"

[*Continued from page* 120]

An old tin box serves as a lamp-housing. This is not a stunt; most tin boxes are air-tight and hence light-tight, so that the constructor is saved the trouble of making a light-tight box. Furthermore, the inside of the box is usually very brightly plated, which makes the box an admirable reflector.

The box can be either round or square, as long as the cover is big enough to include the whole area of the negative box, with some overlap. The box itself should not be smaller than the one described here as over-heating would result in a smaller box. Cut the cover as shown on page 106, and slip the bent sections into the negative box; line up all the joints flush, fasten the lower portion with wood screws as in the photographs, and solder all around where the cover joins the negative box. This makes a firm, light-tight assembly. Next mount a lamp-socket as shown, allowing about one inch clearance from the bottom of the tin can. When the can is inserted in its cover, the camera and lamp-housing assembly is complete.

The construction of these units should be clear from the photograph on page 105 and the sketch on page 106. It is advisable to paint the easel with white enamel, so that the images show up clearly when focusing. A shelf bracket supports the easel, which is further secured by wood-screws in the enlarger baseboard.

The guides can be made from lengths of quarter-round or flat molding. In laying them down, the camera base should be used as a spacer, thus insuring a close fit. A coat of varnish stain completes the job.

Remember that the photoflood gets very hot if allowed to burn for any length of time. If the printing time exceeds twenty seconds, it is advisable to break up the exposure into periods of about fifteen seconds, allowing a short time in between for the enlarger to cool down. Generally, however, it will not be necessary to expose longer than twenty seconds. The iris diaphragm should of course be wide open, and the shutter set for "time." Enlarging paper is fastened to the easel with push-pins.

If you are interested in any of the items mentioned in this issue, send a stamped, return envelope for the address of the manufacturer.

NOTICE

Changes in the make-up and title of this magazine, designed to make your favorite publication better than ever before, will become effective with our next issue. Be sure and reserve your copy now. Our new name will be—"MECHANIX ILLUSTRATED."

MAKE YOUR PICTURES

LIVE

IN LIFE SIZE AND FULL COLOR

WITH AN

argus

PROJECTOR

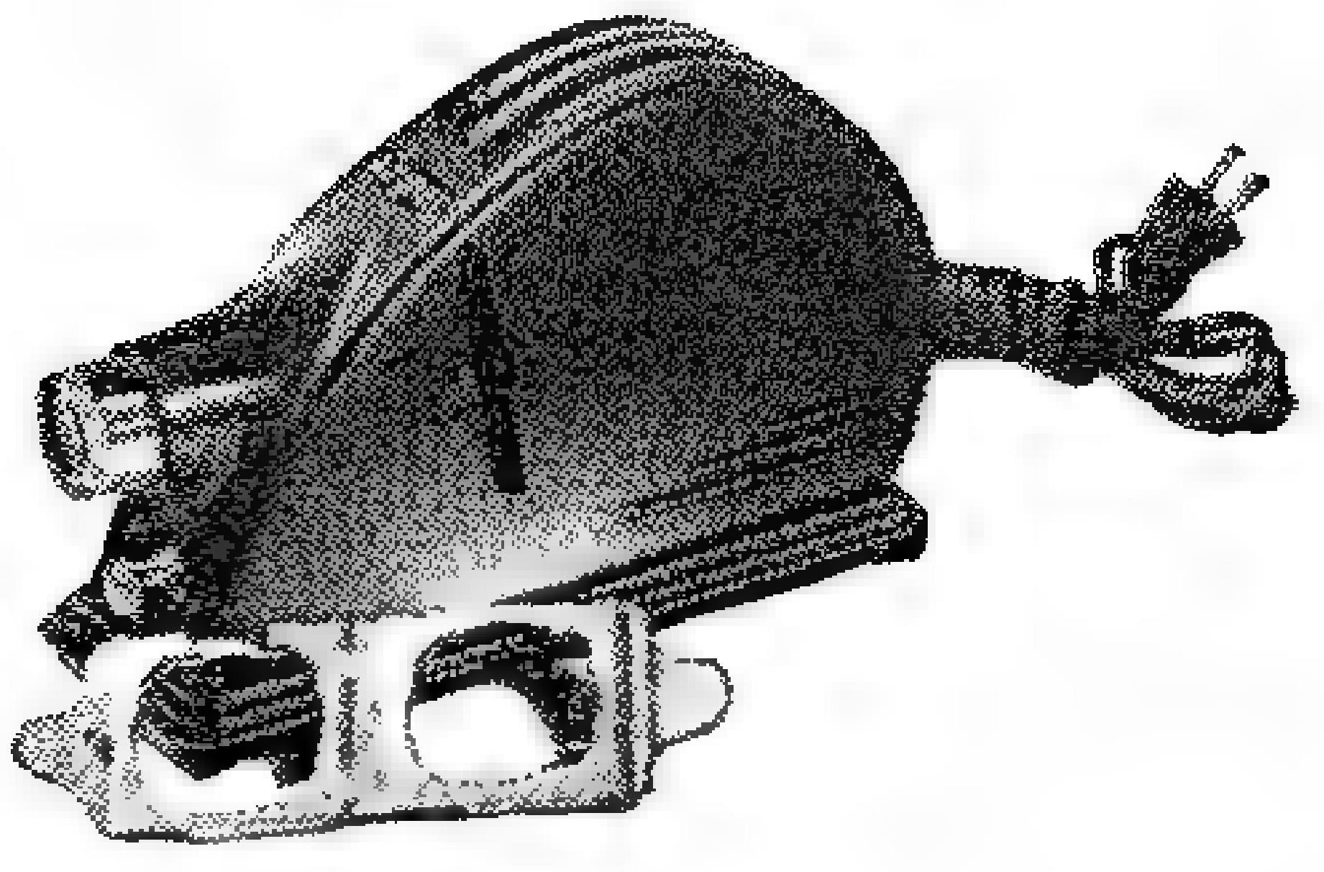
For owners of Argus, Contax, Leica, Retina, Bantam Spl. and all other 35 mm. Cameras.

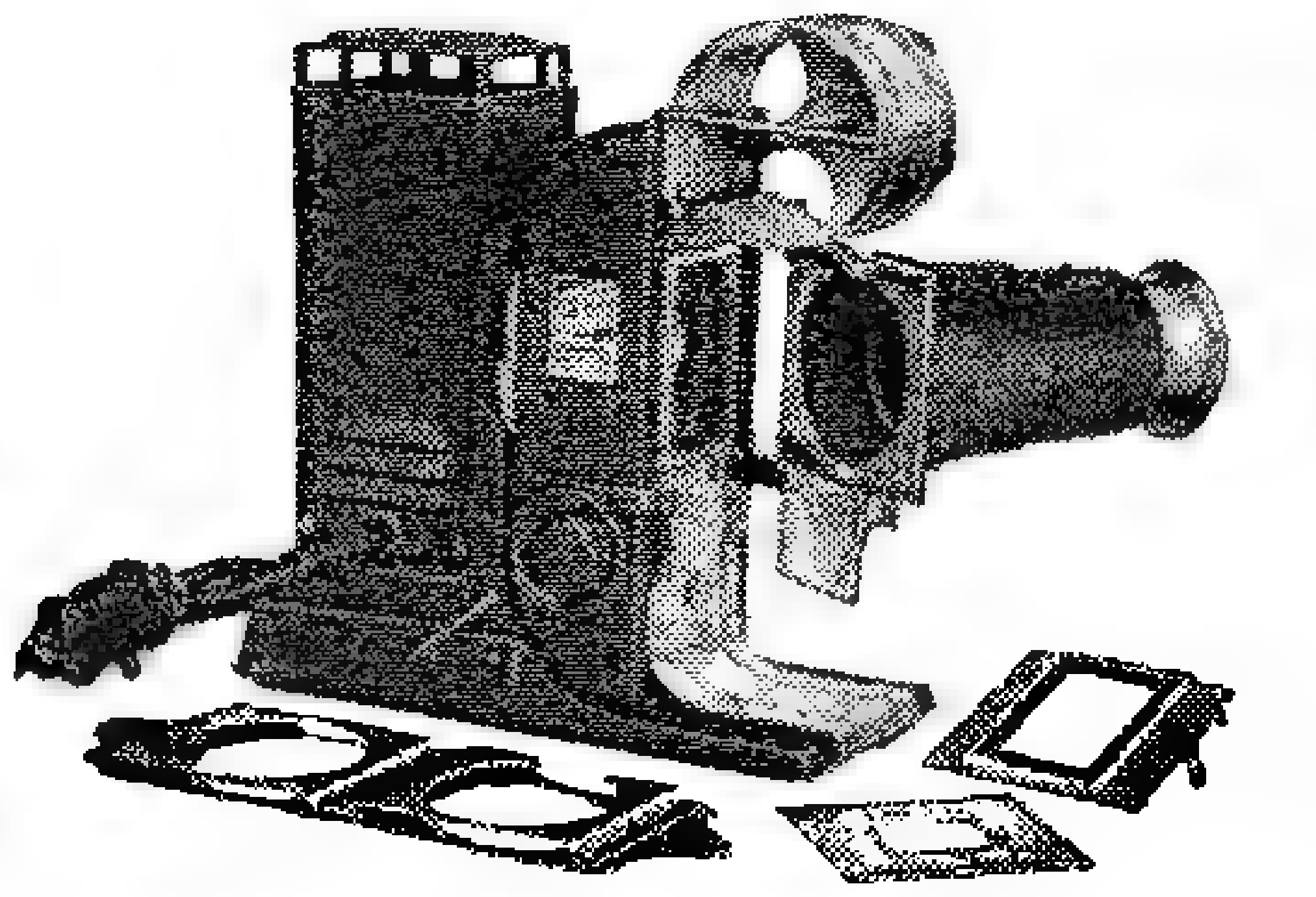
With an ARGUS projector photography is more fun than ever before. There's a new thrill when you see your pictures on the screen in life size and full color. And everyone can now afford to own an ARGUS projector.

MODEL CP

The outstanding projector value—modern styling in beautiful finish. Has 4" high-precision lens; complete with 100 w. lamp and carrier.

$15.00



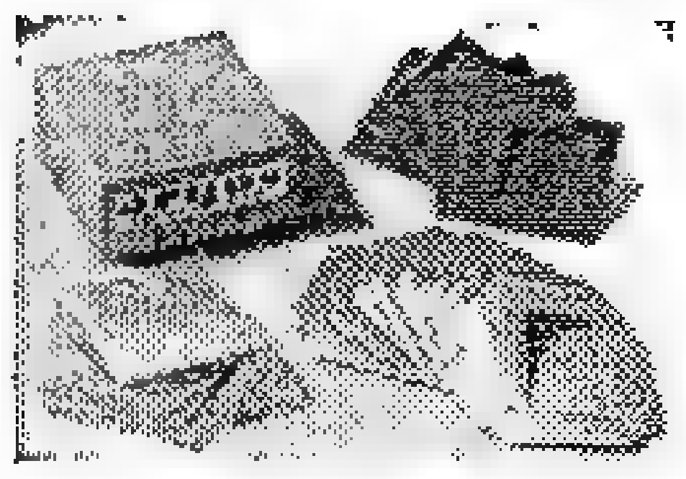


MODEL B

Powerful projector of improved design with swivel head and tilting lever. Automatic film pressure release prevents scratching film.

Complete line of accessories available.

$32.50

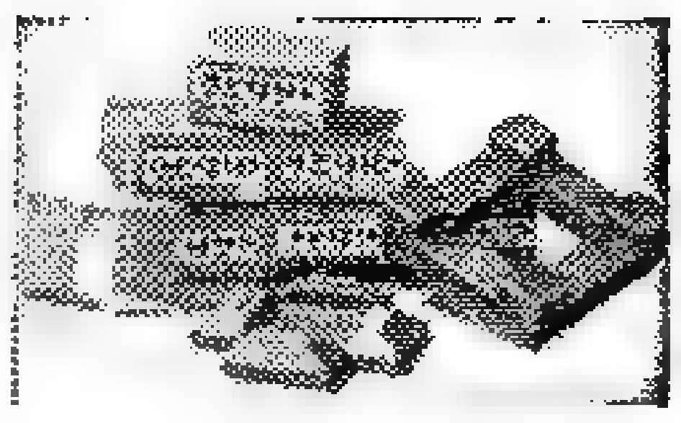


ARGUSLIDE KIT 75c

Contains glass, patented binding stickers and film centering masks for making one dozen complete slides.

ARGUSLIDE BINDER KIT

Has complete materials for making 6 dozen slides *plus* the ARGUSLIDE binder for assembling and sealing slide glasses. **$5.00**



INTERNATIONAL RESEARCH CORPORATION

136 FOURTH AVENUE ANN ARBOR, MICH.

PATCH HOLES IN WALLS
EASILY AND PERMANENTLY

RUTLAND PATCHING PLASTER
BREAKS IN PLASTERED WALLS
RUTLAND PATCHING PLASTER

Rutland Patching Plaster makes a perfect patch as lasting as the wall itself — and anyone can use it.

do—it—with—squabs

Marketed when only 25 days old. Write a postcard, get FREE EYE-OPENING Picture Book. Why breed for ordinary trade when these great luxury national markets are wide open for all the SQUABS you can ship, every day in the year? Go after this desirable, profitable trade now. Write today to

RICE FARM, 602 H St., Melrose, Mass.

3-IN-ONE OIL KEEPS GOOD TOOLS GOOD!
3 IN

For cleaning and oiling tools, for adding smoothness and speed to action points of braces, always use 3-In-One Oil. Its "triple-action" cleans, oils, prevents rust. At hardware, drug, grocery and 10¢ stores.

3-IN-ONE OIL

Test Your Model Airplanes

[*Continued from page* 77]

ailerons, rudder and stabilizer of the model.

The cabinet of the wind tunnel can be made from scrap lumber and the outer sheeting can be constructed from wallboard. A celluloid window should be incorporated in the cabinet's construction so that observations of the model's movements can be made. The overall dimensions of the cabinet can be increased if desired.

The honey-comb core can be made from strips of sheet metal, notched half through and interlocked, as shown in the sketch. The notching of the strips can be done quickly by clamping all the strips together and then sawing half through with a hack-saw at one-inch intervals.

The air pass, which directs the air blast from the fan to the cabinet, is made from scrap sheet metal, following the dimensions shown in the sketch. This should be nailed or screwed directly to the cabinet framing. Be sure the air pass is fitted with an end block featuring a diameter capable of accommodating the whirling blades of the fan.

The dynamometer assembly is clearly shown in the sketches and, when completed, is screwed to the floor of the cabinet by means of a wooden bracket mounting. The model to be tested is suspended in the rubber-band yoke of the dynamometer and braced with other strands of rubber, which extend from the nose, wing and tail. These strands are solely to balance the model in the air stream and should therefore have very little tension.

The lift indicator scale of the dynamometer should be calibrated to read in the same units as the postal scale which is used to register the drag of the model. This can be accomplished by adjusting the tension spring of the dynamometer. The movable lead weights on the balance arms of the dynamometer should be adjusted (to compensate for the model's weight) so that both the lift and drag scales register zero BEFORE the fan is started. Once the fan has been turned on, the lift and drag will be indicated immediately.

Construct A Gate Leg Table

[*Continued from page* 83]

Top Batten and Bottom Rail:
2 pieces, 1″ x 3″ x 13″

Square to exact sixes. Mark cutouts for gates at position indicated in plan. Mark and bore end of each piece for dowel joints and scribe coinciding lines on end cleats and feet to assure accuracy of dowel joints in later assembly. Shape edges of these members as indicated in plan. Mark off and bore holes for pivot dowels. Bore pilot holes in top batten for screws which will later attach under structure to top. Glue and clamp dowel joints, assembling ends, top batten and bottom rail.

Gate Rails—(Top and Bottom):
4 pieces, 1" x 1½" x 9"

Square to sizes and cut tenons. Assemble to gate post and pivot post. Bore ends of turned pivot post for pivot dowels. Attach gates to part already assembled, tapping pivot dowels into place through top batten and bottom rail. Glue pivot dowels into place.

Top:
2 pieces, ⅝" x 9½" x 20" (leaves)
1 piece, ⅝" x 5" x 20" (center piece)

Square pieces to size and mark to oval shaping according to graphed template shown on plan. Shape edges to regular half rounding. Set hinges into place. Glue gate stops on under surfaces of leaves at position indicated in plan. Assemble top to under construction with four 1½" screws running through top batten.

If the table is made of walnut it should be thoroughly sanded before any finishing materials are applied. Too much emphasis cannot be placed upon this point, for walnut is a wood which requires a maximum of sanding in order that its best characteristics of graining and texture may be brought out.

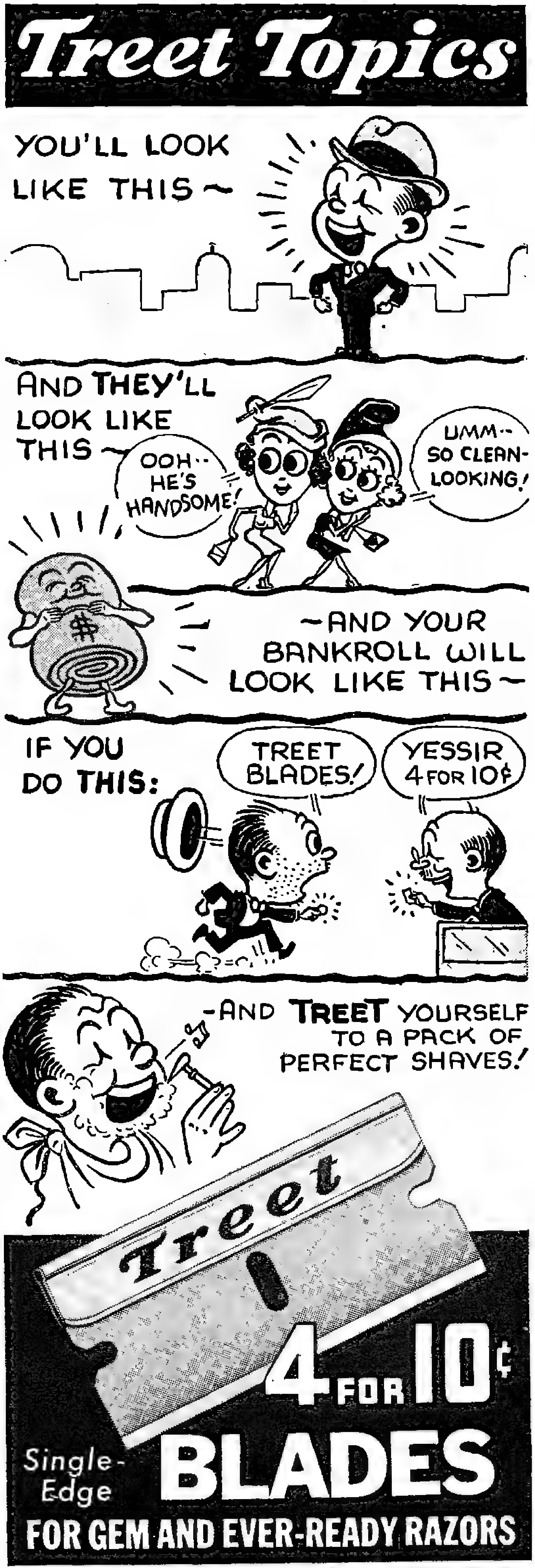
The craftsman should be most cautious in his selection of stain. A good quality oil stain is highly suitable but if the individual desires to mix his own he should experiment on scrap pieces of walnut before applying this stain to the article itself. In this way he may determine the exact tone desired.

It is considered good practice to stain the entire article first before applying the filler. The primary coat of stain is thoroughly and evenly rubbed, after which a filling solution, colored with the *same* walnut stain, is rubbed into the graining of the wood. Filler must be carefully removed before the final coat of stain is applied. While it is sometimes contended that a second coat of stain is unnecessary, still, the craftsman will find that such practice is expedient for the sake of obtaining absolute uniformity of tone.

When the stain has become thoroughly dry, apply a thin coat of white shellac. This is permitted to dry and is then lightly rubbed with fine steel wool. Two additional coats of thin shellac are then applied, each in turn being rubbed with steel wool. The entire table is then carefully waxed and rubbed to a warm luster with a soft cloth.

NOTICE

Changes in the make-up and title of this magazine, designed to make your favorite publication better than ever before, will become effective with our next issue. Be sure and reserve your copy now. Our new name will be—"Mechanix Illustrated."


Treet Topics
YOU'LL LOOK LIKE THIS ~
AND THEY'LL LOOK LIKE THIS ~
OOH·· HE'S HANDSOME!
UMM·· SO CLEAN-LOOKING!
~AND YOUR BANKROLL WILL LOOK LIKE THIS ~
IF YOU DO THIS:
TREET BLADES!
YESSIR 4 FOR 10¢
-AND TREET YOURSELF TO A PACK OF PERFECT SHAVES!
Treet
4 FOR 10¢
Single-Edge BLADES
FOR GEM AND EVER-READY RAZORS

Treet Safety Razor Corporation, Newark, New Jersey

FREE TRIAL OFFER

NEW REMINGTON NOISELESS PORTABLE

AS LOW AS 10¢ A DAY

FAMOUS Remington Noiseless Portable that speaks in a whisper, as little as 10c a day. Standard Keyboard. Automatic ribbon reverse. Variable line spacer and all the conveniences of the finest portable ever built. PLUS the NOISELESS feature. Act now. Send coupon TODAY for details.

You don't RISK a Penny. We send you a Remington Noiseless Portable for 10 days' free trial. If not satisfied send it back. We pay all shipping charges.

Typing course and carrying case. You will receive FREE a complete simplified home course in Touch Typing. Also, a handsome, sturdy carrying case. No obligation. Mail coupon for full details—NOW.

Remington Rand Inc., Dept. 141-5
465 Washington St., Buffalo N. Y.

Tell me, without obligation, how to get a Free Trial of a new Remington Noiseless Portable, including Carrying Case and Free Typing Course for as little as 10c a day. Send Catalogue.

Name..

Address...

City.............................. State................

60 POWER TELESCOPE $2.19

VARIABLE EYEPIECE. 20X—40X—60X

NEW! **Three telescopes in one. 3 different magnifications.** 20 power for ultra-bright images with 40 and 60 power for extra long range. Guaranteed to bring distant objects, people, sports events, ships, moon, stars, etc. 60 times as close. Most powerful made for anywhere near the money. Closes to less than a foot in length. Multiple lens system. 30 mm. objective, in heavy brass mount. Directions included for using as a compound 4 lens microscope. American made. We pay the postage. Only $2.19.

Catalog of Microscopes, Binoculars, etc. FREE on request.
BROWNSCOPE CO., Dept. 75, 5 W. 27th St., New York, N. Y.

INVENTORS
PATENT YOUR IDEAS
SEND FOR FREE BOOK →

HOW TO OBTAIN A PATENT

Written by a Former Member of the Examining Corps (1922-24) of the U. S. Patent Office. If you want to profit by your idea, you should take steps to apply for a U. S. Patent at once. Your first step is to get this Free Book. This interesting illustrated book contains valuable information you should have. It tells you fully how to obtain a patent on your idea in the quickest way. With this Free Book you will also receive a "Record of Invention" form on which you can easily record your idea. Personal and Confidential Service: Your case will be personally handled only by a Registered Patent Attorney who is also a Former Member of the Examining Corps of the U. S. Patent Office. All communications confidential.

MAIL COUPON TODAY for FREE PATENT BOOK and RECORD OF INVENTION Form

CARL MILLER
REGISTERED PATENT ATTORNEY
FORMER MEMBER EXAMINING CORPS U. S. PATENT OFFICE

Woolworth Bldg., 35th Floor, Dept. 58B, New York City
MILLER BUILDING, Dept. 58B, WASHINGTON, D. C.
Please send me your Free Book, "How to Obtain a Patent," and your "Record of Invention" form.

NAME ....

ADDRESS ....

A Home-Made Drag-Saw

[*Continued from page* 87]

a model-T Ford engine connecting rod, as indicated in the layout.

A universal joint, which is placed between the engine drive shaft and the automobile steering gear worm that serves as a reduction gear assembly for the crank-arm shaft, consists simply of a piece of extra heavy duty, high pressure air hose. The reduction gear, as stated before, consists of a heavy worm steering gear from an automobile and is geared to the crank-arm shaft that motivates the saw guide by means of two timing gears taken from a model-T Ford.

The crank-arm shaft is made from a 1929 Whippet auto axle, turned on a lathe to fit the bearings at hand so as to form a pressed fit with the gear, utilizing the key-way and threaded end to secure the gear, cam and crank-arm to the shaft. The reduction gear and crank-arm shaft are assembled on pillow-block bearings and bolted to a ⅜-inch steel plate which, in turn, is bolted to the frame.

The cam that rocks the saw is made of one-inch soft steel which is turned to a three-inch diameter and bored off center. The cam bearing is made of two pieces of 1x2½x5-inch soft steel bored to three and one-quarter inches and babbitted to fit the cam. This is held in place by two three and one-half-inch collars, one-eighth-inch thick, as shown in assembly sketch.

The cross-head guides are two model-T Ford steering rods, the cross-head itself being a piece of steel ½x6x12 inches in size with two 1x12-inch pipe nipples bolted and welded to it. The nipples are babbitted to fit the guide rods. The crank-arm is steel, ½x2x12 inches in size and has a nine-inch throw.

The saw should have an eighteen-inch stroke, the connecting rod between the cross-head and the crank-arm being made up from one-half-inch pipe with babbitted tees at each end. Guide rods for the saw are secured on one end by the cam bearing and on the other end by a ½x2-inch piece of strap metal bent to form an anchorage for the saw handle.

A Model Airplane Jig Saw

[*Continued from page* 81]

is bolted to the commutator. The lower grip should center about one-half inch from the commutator.

The arm is a ⅜ inch steel rod, bent as shown, flattened at one end, and drilled to take the upper bearing. The block forming the rear of the frame is drilled to take the rod, which is fastened in place with two 3/16 inch screws. The interval between the arm and lower blade grip must be determined by the length of the upper bearing and the size blades to be used.

Filter Facts And Factors

[*Continued from page* 120]

ter to ⅕ second, or leaving the shutter at 1/10 second and opening the diaphragm to 11.

Accompanying all roll and cut film is a sheet of instructions which includes filter factors for each particular kind of film for daylight and mazda illumination and for particular filters made or sold by the manufacturer of the film. If filters of another make are used, the given filter factors may or may not be correct, and it is highly advisable to try several exposures of the same scene with slightly different factors. This is especially necessary if the normal exposure is made by guess work, without the aid of a reliable photo-electric type exposure meter. If the "normal" exposure is off a little, the negatives with the filter may be over- or underexposed very badly. While the exposure latitude of most film is sufficient to cover reasonable variations from the ideal exposure, it may not be enough to take care of an incorrect exposure whose error is multiplied from 2 to 5 times by the filter factor.

Filters for amateur purposes consist of a thin sheet of dyed gelatin cemented between two pieces of glass, and mounted in a metallic ring of some sort that slips over the camera lens. Actual colored glass (that is, glass to which a coloring pigment is added during the firing process) is used for some type of expensive filters. It should be evident to any sensible person that a filter must be of the same high optical quality as the camera lens itself if the sharpness, detail and other characteristics of the picture are to be retained, but many owners of expensive miniatures costing several hundred dollars skimp on their filters, thinking of them only as "accessories."

Gelatin filters are susceptible to heat, and must therefore be protected in a box or container of some kind if carried on the person. They should be handled only by their edges, and wiped clean of finger marks with lens tissue before they are used. The best way to attach them to the camera is by means of a combination sun shade and filter holder, an inexpensive accessory of great value.

A list of addresses of manufacturers of items mentioned in MODERN MECHANIX will be sent to any reader upon receipt of a stamped, return envelope.

NOTICE

Changes in the make-up and title of this magazine, designed to make your favorite publication better than ever before, will become effective with our next issue. Be sure and reserve your copy now. Our new name will be—"Mechanix Illustrated."

Indian . . packs a PUNCH!

PRICES ON NEW MODELS BEGIN AT $215. F.O.B. FACTORY FULLY EQUIPPED

FREE! Get this RIDER'S HELMET and INDIAN PIN

MAIL COUPON TODAY!

NEW THRILLS ON THE OPEN ROAD

Find new thrills with a new 1938 Indian! Prices begin at $215 for the twin-cylinder Junior Scout—America's greatest motorcycle value. All models, including DE LUXE 4, CHIEF 74 and SPORT SCOUT, can be purchased on Indian's easy pay-as-you-ride plan.

MECHANICAL PERFECTION

The new Indians are streamlined powerhouses—durable, dependable, easy to start, and to handle—tops in mechanical perfection. Ask your Indian dealer today for the amazingly low figures on upkeep and operating cost. It's easy to *want* an Indian—and easy to *own* one!

INDIAN MOTOCYCLE CO., Springfield, Mass.

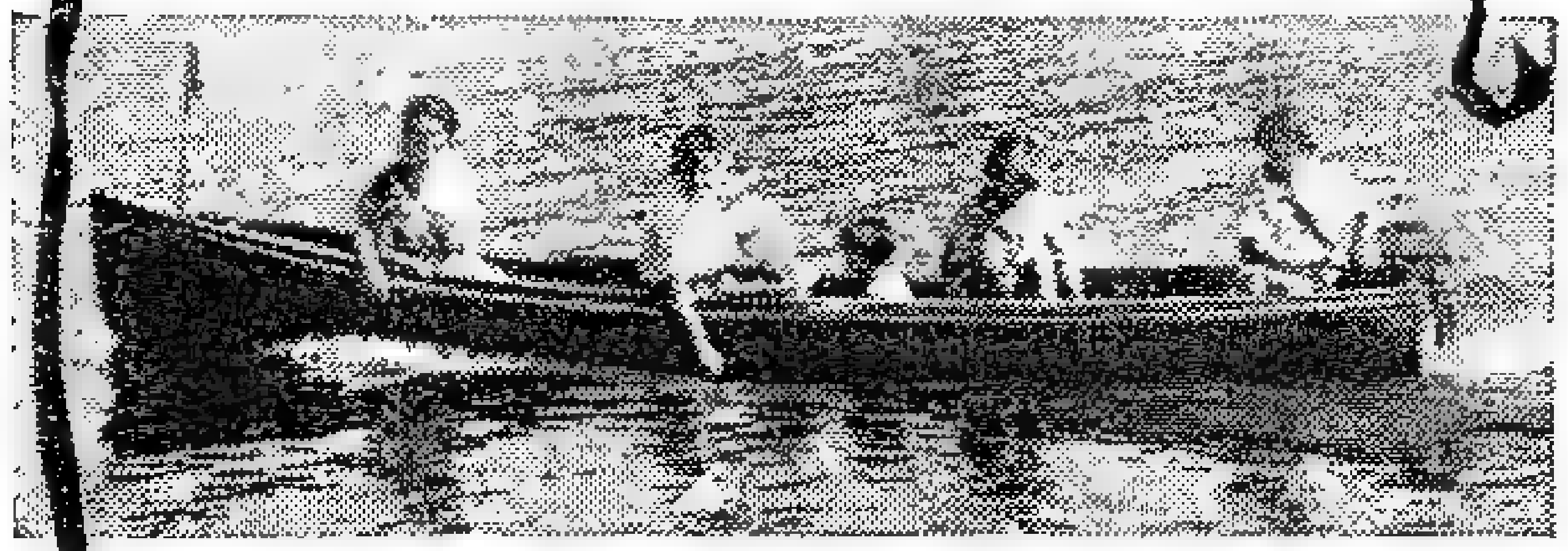
INDIAN MOTOCYCLE CO., Springfield, Mass.
Please send me at once, without obligation, your illustrated Folder showing the new 1938 Indian Motocycles, and CERTIFICATE of VALUE entitling me to FREE RIDER'S HELMET and INDIAN PIN, as illustrated, when I place my order.

Name..........

Address.......... MM58

Please be sure to check your age group:
☐ 16-19 years ☐ 20-30 years ☐ 31 years and up ☐ under 16 years

MORE PEOPLE
MORE FUN
in this sturdy boat



• OLD TOWN BOATS take a tremendous load for their size. They're trim craft, with graceful lines for speed and comfort. Built and braced to stand the heaviest outboard motors.

You never have to baby an Old Town. There are tough, fast, open-deck models for sport. Big seaworthy boats for the family. Made of the finest materials by expert craftsmen.

FREE CATALOG illustrates boats for sport, big all-wood boats for the family, and all kinds of Canoes, Outboard Boats, rowboats, dinghies. Write today. Address Old Town Canoe Company, 465 Main Street, Old Town, Maine.

"Old Town Boats"

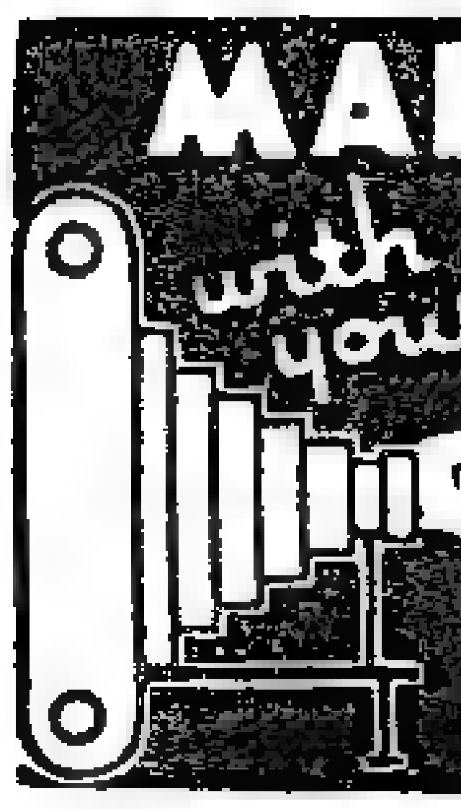
WIND DRIVEN Electric PLANT

Build Your Own—We Show You How!

Make auto generator light buildings, play radio, run washing machine and other motors from FREE WIND POWER. Earn money making for others. Dime brings complete building plans and 1938 catalogue listing over 500 windcharger electrical items. Most complete windcharger catalog; welders, electric fence, etc., over 100 other generator changes into 6-12-32 and 110 volt plants.

LEJAY MFG. CO., 414 LeJay Building, Minneapolis, Minn.

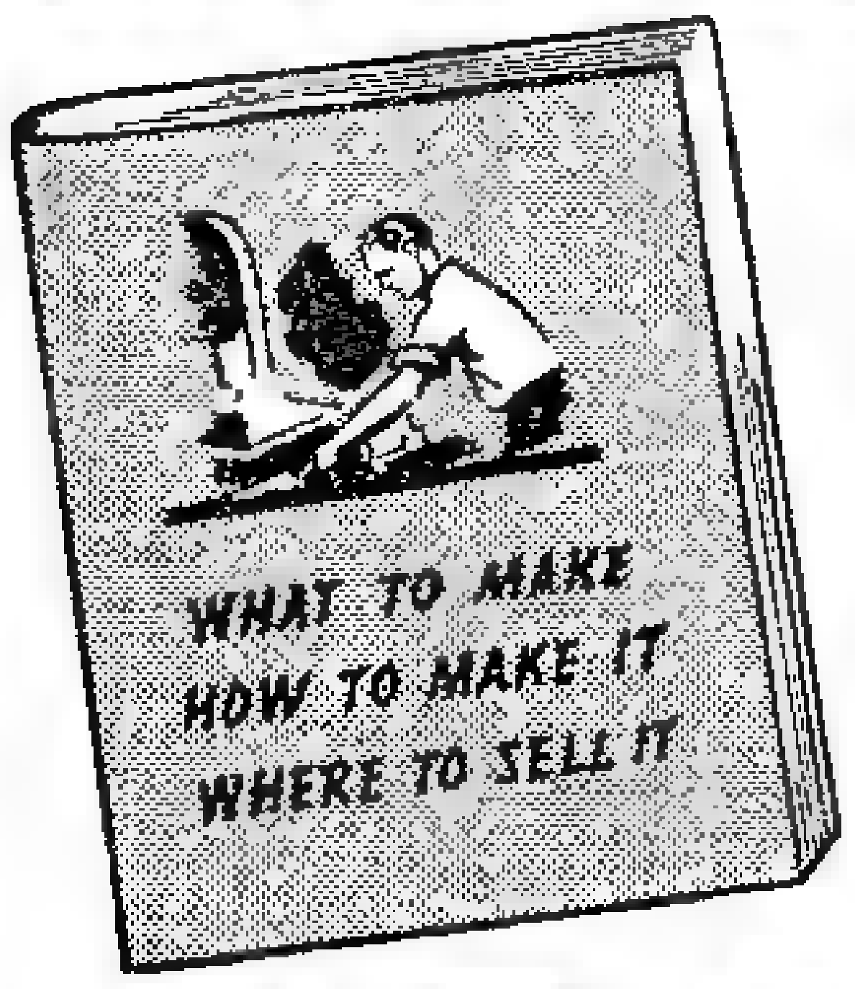
MAKE MONEY with your CAMERA



Thousands of publications buy MILLIONS of photos yearly from amateurs. We show you what to photograph, how to do it, where to sell for biggest profits. Learn at home to become a journalistic or press photographer. Pay for course in easy installments. Use any camera. Write for FREE BOOK. UNIVERSAL PHOTOGRAPHERS, Inc., Dept. 335, 10 West 33rd Street, New York, N. Y.

FREE BOOK

Earn Spare-Time Money THIS NEW PLEASANT WAY!



Learn how you can build up a profitable spare or full-time business in your own home. This new book "How to Make Money in Woodworking" is crammed with practical tested ideas, plans, and suggestions. Tells you exactly what to make, how to make it and how to sell it. Describes plans that have worked for others. Woodworking, the new way, is light, pleasant, and profitable. Send only 25c and complete book will be mailed postpaid. Satisfaction guaranteed or money refunded. Write to Dept. M538.

Delta Mfg Co. 600 E. VIENNA AVE. MILWAUKEE, WIS.

A Wrought Iron Globe Light

[*Continued from page* 71]

the size of the base and the band will have to be varied accordingly. If a 7-inch globe is used, it will be necessary to have approximately 6 feet of band iron $\frac{5}{8}$-inch by $\frac{1}{8}$-inch.

The iron is hammered on one side with a ball-peen hammer to relieve the stiff and cold appearance. A little practice on a scrap piece of iron will develop the desired technique. Carefully straighten out the iron before proceeding with the bending of the pieces.

In bending the band and the scrolls it is well to check the work against full-size drawings laid out on paper. In order to insure the making of uniform scrolls, use a scroll former as shown in the sketch. To make a former use a piece of iron approximately $\frac{1}{4}$-inch thick. Drill a 3/16-inch hole and then complete the design with a hacksaw and files. The scrolls may be easily bent if the iron is first heated red hot.

If a forge is available, weld the band, otherwise splice the ends. The central rivet holds the splice as well as the cross piece of the base. The holes accommodating the rivets are countersunk so that the rivets may be hammered flat with the surface of the iron. A $\frac{1}{8}$-inch pipe nipple one-inch long is used to attach the lamp socket to the band. The electrical cord should be of the flat rubber covered variety and is attached to the under side of the iron band with small cotter pins or wire hair pins passed through the small holes and clinched on the outside.

Protect the iron from rust by the application of thin coat of clear lacquer or a coat of black paint. If black paint is used, rub out high lights on the iron with a cloth while the paint is still wet.

Cigarette Box Has Trick Lid

[*Continued from page* 91]

the corners, as shown, then drill small holes for the pins at right angles to the notches. Do the same with the lid. The holes should be just large enough to receive small brass escutcheon pins. Form a loop at one end of each of the four pieces of brass wire, then drill each loop to assure a perfectly round hole so that the hinges will work smoothly. The loop ends attach to the lid. Form the other ends so that each turns back on itself to make a U, for attaching to the escutcheon pins in the box. Loops cannot be used here as allowance must be made for a shortening of the wires when the lid is raised.

Red enamel is an attractive finish for the box; cover the bottom with black felt and attach an imitation-cigarette handle to the lid. The imitation cigarette is made by coating a $2\frac{3}{4}$-inch dowel with white enamel and pasting a brown paper band to one end to simulate a cork tip. Glue snippings of red foil to the other end to imitate fire.

Biggest Little Show On Earth

[*Continued from page* 118]

flour and meal. There is the Power Wagon on which is mounted the gasoline engine and dynamo, which (supposedly) furnishes power for the show; the Property Wagon, Tanker, Pole Wagon, Stake Driver and all the others.

We may watch the Stake Driver at work as it drives the long tent pegs into the ground.

It is with extreme reluctance that we take leave of Parke's Biggest Little Show On Earth. And the children—well, try to drag them away! We'll not be content to depart, however, without asking at least one of the thousand and one questions that visitors always ask. We quickly discover that Circus-whittler Clyde Parke is not only a genius, but a genuine host. There is only one question he cannot answer: "How much is the circus worth?"

"Well," he laughs, "I wouldn't take a dime less than $30,000 for it!"

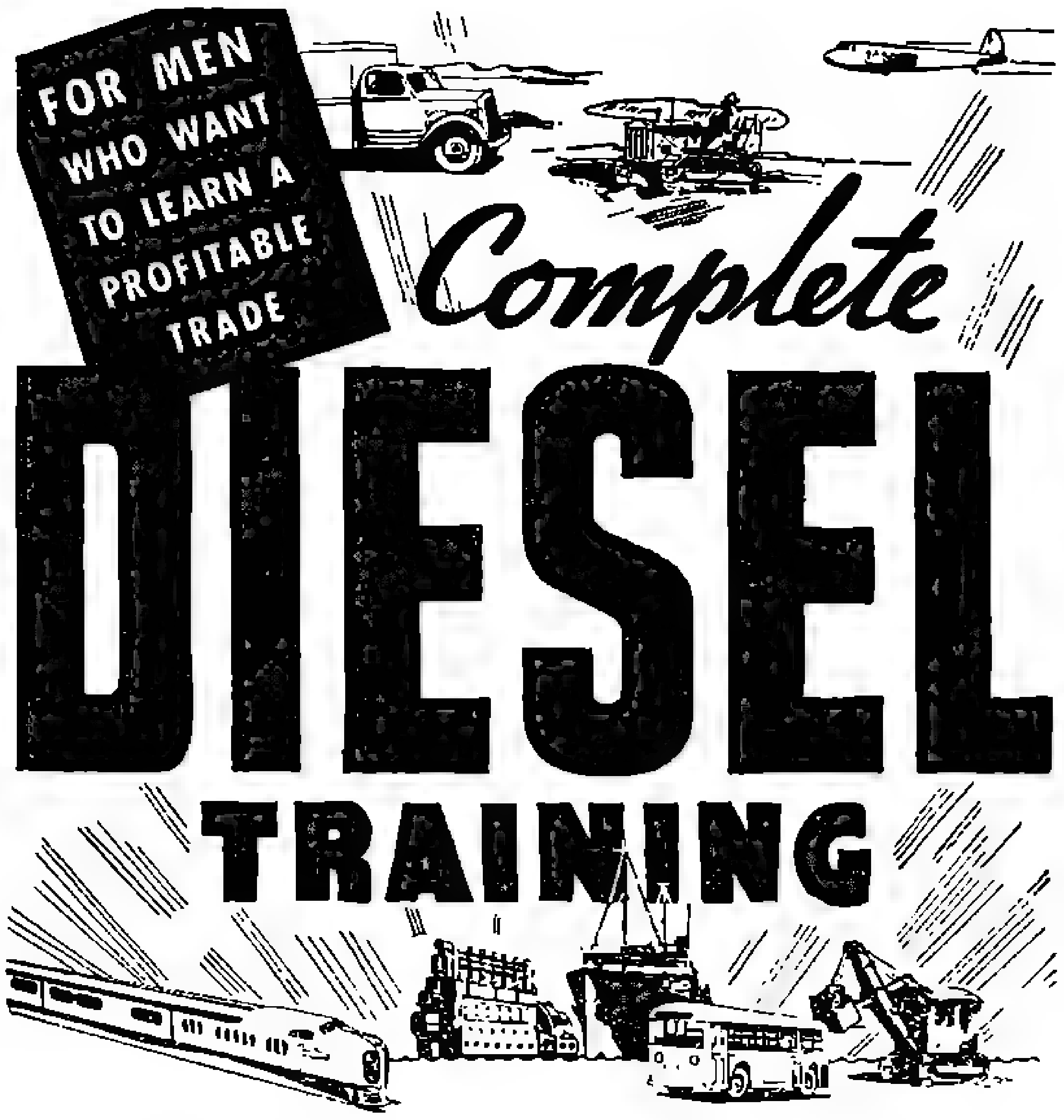
Now the question arises, "Why a miniature circus?" Asked "why" a dozen years ago, Mr. Parke would have been stymied for an answer. He did not set out to be a wood carver. Nor did he intend being a circus operator. By profession he is an accountant. He just "happened" to discover his ability with a knife. The carving of miniature wood figures gradually developed into the circus idea.

Like all small boys—and most oldsters—Mr. Parke was an ardent circus fan and never missed any of the big shows that came to town. Being a close observer, he saw many things the crowds missed. These youthful observations are evident today in his great show.

Nothing is missing. Every detail almost "breathes" naturalness. The only tools used in his work were a small puzzle-making machine, consisting of lathe, sander, jig-saw and his pen knife. His method of carving a figure is simple: First, he outlines it on the face of a block of Michigan pine, the wood used by pattern makers. Then the large portions are sawed out. The balance of the work is done with carving knife and gouge. It takes about 12 hours to whittle out a horse, with harness on; about eight hours without harness. Other figures require proportionate periods of time. Shellac, or a bath in lacquer, after the colors have been applied, finishes the figure.

Animation of the animals and actors in their astounding feats is accomplished by a single quarter-horse power electric motor, remotely controlled.

Today, at 50, Clyde W. Parke is master of the most unique circus in existence, one which old-time showmen acclaim as the most complete and amazing mechanical marvel in the world. In a five weeks' run staged in Memphis some months ago, attendance ran into the thousands, proving that miniature shows have plenty of "box office" appeal.



FOR MEN WHO WANT TO LEARN A PROFITABLE TRADE
Complete
DIESEL
TRAINING

—with all types
INTERNAL COMBUSTION ENGINES, ELECTRIC POWER GENERATION, Etc.

YOU MEN who are sincerely ambitious to make good in the Diesel and related industries, want to know the true facts—you want to know about employment opportunities and employment requirements. For 33 years, National Schools, a recognized leader in the field of trade education, has played a vital part in helping wide-awake men to qualify for success in industry. National Schools—a million-dollar trade school—will supply you with a sincere, honest statement of facts on what you should do to get into the profitable Diesel Industry. No exaggerations—no mis-statements.

YOU NEED REAL SHOP EXPERIENCE WITH TIME-TESTED TRAINING.

Mail the coupon below. In the literature you will be sent, you will see exactly how other men like you are preparing themselves for success in National's modern training shops. You learn on the latest, finest equipment. You do real job work. You learn by time-tested, shop-practice methods. Your training is fascinating in every detail. You are taught how to make good, and helped to make good after you graduate. All of this and much more is clearly pictured for you in the Free Book of Facts we will send to you.

TRANSPORTATION ALLOWED TO LOS ANGELES

National Students are allowed coach railroad fare from any point in U. S. (Canadian students from nearest point of entry). Student social life includes inspection trips, excursions, athletic activities, etc. Special doctor service. Personality coaching. **Many students are helped with spare-time jobs to earn room and board while learning.** (Canadians excepted.) Graduate employment cooperation.

NATIONAL SCHOOLS

FREE BOOK *Los Angeles*

Request for Free Book

NATIONAL SCHOOLS (established 1905) Dept. MMA-5
4000 South Figueroa Street, Los Angeles
Please send me, without obligation, your FREE BOOK and information regarding Diesel Employment Opportunities and Requirements.

NAME________________ AGE______

ADDRESS__________ CITY________ STATE______

SPRING 1938 CATALOG
NO. 71
WHOLESALE RADIO SERVICE

FREE new spring catalog

Ready, fans! New Spring number of the radio catalog supreme! Act now to get first-hand information on all latest type radio equipment. Read about new Lafayette super receivers for '38—advanced line of Lafayette Public Address — real "buys" in famous name cameras. Prices you can't beat anywhere. *Get this amazing FREE catalog NOW!*

LAFAYETTE RECEIVERS
•
CAMERAS
•
Get **FREE** parts list on circuits described in this or any other magazine. Write now.

WHOLESALE RADIO SERVICE CO. INC.
NEW YORK, N.Y. • CHICAGO, ILL. • ATLANTA, GA.
100 SIXTH AVENUE • 901 W. JACKSON BLVD. • 265 PEACHTREE STREET
BOSTON, MASS. • BRONX, N.Y. • NEWARK, N.J. • JAMAICA, L.I.

WHOLESALE RADIO SERVICE CO., INC.
901 W. Jackson Blvd., Chicago • 100 Sixth Ave., New York
(Mail to nearest Warehouse)
Rush Catalog No. 71-22E8 ☐ Send part list—
Name....................................
Address....................................
City....................State..............

RUSH THIS COUPON NOW FOR FREE SPRING CATALOG

PASTE COUPON ON PENNY POST CARD

NOW ONLY $5.00

Over 6,000 GHQ Gas Engines have been sold at $8.50 for the Kit and $12.50 for the finished motor. Now is your chance to buy the *New Improved* kit for $5.00 or the assembled motor for $10.00. Send $1. Shipped Exp. Coll. for balance same day. Catalog 3c. *Dealers write.*

GHQ MOTORS, 854A East 149 St., New York

SHUNNED AT SCHOOL BECAUSE OF PIMPLES?

Take steps to free your blood of skin-defiling poisons

Stop being the victim of ugly hickies. Don't be shunned and laughed at. Get right to the root of the trouble. It may be poisons in your blood.

Between the ages of 13 and 25, important glands are developing. These gland changes often upset your system. At the same time, waste poisons from the intestinal tract may collect in the blood stream . . . bubble out on your skin in disfiguring pimples.

You want to rid your blood of these skin-irritating poisons. Thousands have succeeded—just by eating Fleischmann's Yeast, 3 cakes a day. The millions of tiny, *living* plants in each cake help you keep these poisons out of your blood, give you clearer, smoother skin. Many get splendid results in 30 days or less. Don't waste time and run the risk of permanently damaged skin. Start eating Fleischmann's Yeast today!

A Utility Table For The Auto

[*Continued from page* 98]

the compartment and to be lowered to its normal position without interference with the hinges. In order to do this, slots must be cut into the back of the table. These slots must be large enough to clear the hinges at all times.

The post that carries the weight of the front part of the table is a piece of 1¼" square stock cut just long enough to reach from the under side of the plywood top to the floor of the car when the table is held in a level position. Square across this post at one end is nailed a triangularly shaped brace about 10" by 6". The 10" side is placed square with the end of the post and the 6" dimension runs down along the post as shown in the diagrams. The two sides of the triangle, where the knees might come in contact with them, can be concaved somewhat to allow more leg room if desired.

[*Continued on page* 142]

To Reduce Hum In Receivers

[*Continued from page* 100]

tube and trace the wire to a grid leak or volume control. Connect the resistance-capacitance filter between the leak and C-, as shown. Only a few sets used grid filters because of cost considerations; however, for about 50 cents per tube, the hum can be reduced to a very low level.

Of course, try one tube at a time, as only one tube may be causing the hum. Experience shows that the first a-f tube is the most critical.

Earth Bulge Causes Quakes

The enormous bulge in the earth that has its crest in the Himalaya mountains is responsible for the terrific earthquakes that sometimes rock interior Asia, Prof. D. Mushketov of the Leningrad Mining Institute states, after extensive expeditions in which thousands of observations were taken. The deep-seated forces pushed up the crust of the earth in this region as a man in bed pushes up the covers with his knees. Like the covers pulled over the knees, the thick blankets of rock are under tension. They give way from time to time, and that starts the earthquakes. Accurate measurements made by Professor Mushketov show that in the Pamir region the curvature of the earth is much in excess of the average curvature of the earth as a whole.

NOTICE

Changes in the make-up and title of this magazine, designed to make your favorite publication better than ever before, will become effective with our next issue. Be sure and reserve your copy now. Our new name will be—"Mechanix Illustrated."

U. S. Needs Planes, Men

[*Continued from page* 119]

"Two great air doctrines will motivate all military air work for 1938. The first of these is a realization that airplanes alone do not make an Air Force. Along with modern up-to-date planes must go skilled operating and combat crews, trained maintenance crews, efficient accessory equipment, and ample air bases."

It is my hope that by June, 1940 we shall have the 2320 airplanes needed in our Army Air Corps, and what is equally important, we shall have the trained crews to operate them and make them effective fighting units, plus the trained maintenance crews to keep them fit and sound. Shortly thereafter, I hope we shall have supplied that last requisite element, adequate air bases from which to operate our fighting air forces effectively. When those things are accomplished, when that day comes, we shall take our place, heads up, yielding to no nation in defensive strength, proudly proclaiming the safest air frontiers in the world.

Sun Spots' Effect On Earth-Bound Man Told In Book

DID you know that the best vintage wines are from crops that grow in those years when sunspots are at a maximum? And that trees show their greatest growth in periods when the surface of the sun shows the greatest number of spots? Or that the Dow-Jones stock market averages follow a curve which is very similar to curves based on sunspot numbers?

These are only a few of the many remarkable, but unexplained, coincidences between the activities of plant and animal life on earth and the appearance of those gigantic electro-magnetic disturbances on the sun which man calls sunspots.

More and more scientists, and others, are probing sunspots and seeking to learn the relationship between their appearance and the multitudinous activities of earth-bound man. In his newest book, "Sunspots and Their Effects from the Human Point of View," Dr. Harlan True Stetson, astronomer and research associate of the Massachusetts Institute of Technology, summarizes the knowledge which science now has in its possession to analyze for the truth or falseness of speculation on this intriguing matter.

Dr. Stetson goes out on no limb to forecast, in so many words, a definite relationship. Rather he piles up, item by item, an imposing array of facts which offer a true challenge to those who are skeptical of the sunspot's bearing on terrestrial activity. Sunspots and their effect on human behavior, growing things, business, radio, sunlight, power, earth magnetism and even carrier pigeon flight are presented for the reader to note and draw his own conclusions.

WINTER'S OVER!
CLEAN OUT
ANTI-FREEZE
WITH SANI-FLUSH

RUST and scale have accumulated in your radiator all winter. They are choking the delicate veins that circulate water and keep your motor cool. An overheated motor is a lazy motor. And overheating may cause costly damage. Clean out your radiator. It costs only 10c. (25c for the largest trucks and tractors.)

You can do it yourself in a few minutes. Pour a little SANI-FLUSH in the cooling system. Run the engine. (Follow directions on the can.) Then drain, flush and refill with clean water. Do this regularly, twice a year. Keep the radiator clean and clear. Motors run cooler. Save power. Save repairs. SANI-FLUSH can't harm motor or fittings. You'll find SANI-FLUSH in most bathrooms for cleaning toilets. Sold by grocery, drug, hardware, and five-and-ten-cent stores. 25c and 10c sizes. The Hygienic Products Company, Canton, Ohio.

Sani-Flush Safe NOT CAUSTIC

KEEPS RADIATORS CLEAN

BILD-UR-OWN

COASTERS • MIDGET AUTOS • SCOOTERS • BIKE TRAILERS, ETC.

SAVES YOU MONEY TOO!

YOU WANT THE BEST FOR YOUR MIDGET CAR

Equip it with our guaranteed quality DISC WHEELS mounting Balloon Tires. Your choice of these famous makes

GOODRICH — GOODYEAR — FIRESTONE

At lowest prices. We provide Scooter Kits, Midget auto kits etc. at great savings. Now is the time to build yours. We also carry a line of larger Tires and Wheels, Motors, etc. Write for prices.

BILD-UR-OWN DEVICES

5237 Lake St., Dept. B-5, Chicago, Ill.

SINGLE SHAFT Means REVERSE

New $49.50 F.O.B. Factory 17 lbs.

Johnson Sea-Horses are the only outboard motors that give you 360° steering and **REVERSE!** They are modern motors, with all the modern developments, including patented co-pilot, underwater exhaust, perfected alternate firing. Also Ready-Pull Starter models.

FREE WRITE for your copy of the new Sea-Horse Handy Chart. It describes Johnson's 9 great models for 1938!

JOHNSON MOTORS
200 PERSHING ROAD
WAUKEGAN, ILLINOIS

JOHNSON Sea-Horse OUTBOARD MOTORS

BIG MONEY Assembling New PORTABLE BOAT!

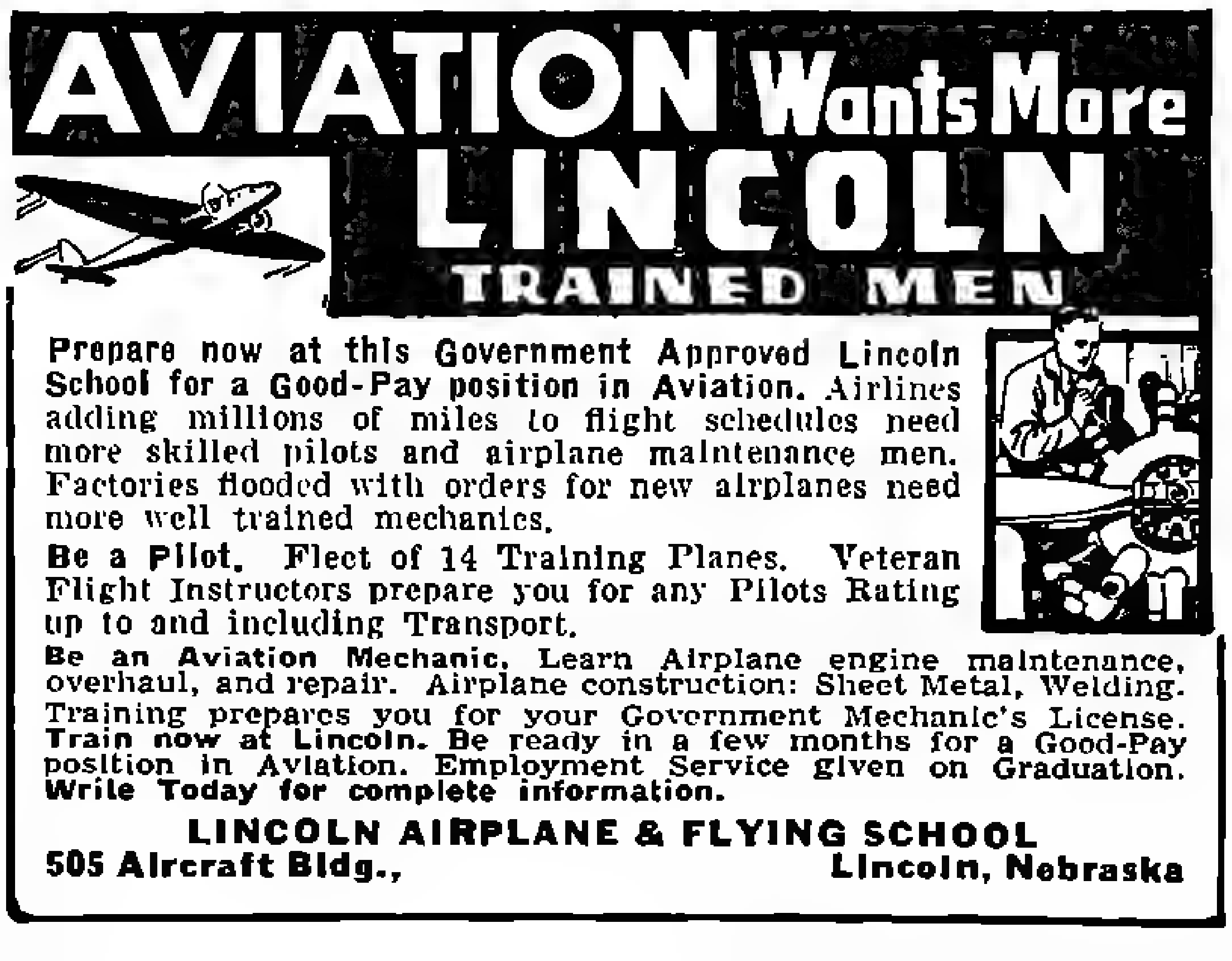
At Home
Weighs only 20 lbs.

5½ YEAR OLD BOY

Carry It On Bike or By Hand

BOYS—see how easily this 5½ year old youngster carries his MEAD KI-YAK! What fun you'll have with one—AND—you can assemble it YOURSELF at home in a few hours from our numbered, cut-to-fit Construction Kit—and SAVE HALF the factory-built cost, or sell it for big profit! Tell DAD about this educational money-making project! Sold direct from factory at factory prices. **Rush 10c NOW** for Circulars showing 57 beautiful photos of Mead Ki-Yaks—sailing, paddling, and with motor—Low **Factory-to-You** Introductory Prices. $6 Gift Paddle Offer. HURRY!
MEAD GLIDERS, 15 S. Market, Dept. M-58, Chicago.

$6 PADDLE GIVEN with your CK-Ki-Yak-*if you hurry*


AVIATION Wants More LINCOLN TRAINED MEN

Prepare now at this Government Approved Lincoln School for a Good-Pay position in Aviation. Airlines adding millions of miles to flight schedules need more skilled pilots and airplane maintenance men. Factories flooded with orders for new airplanes need more well trained mechanics.

Be a Pilot. Fleet of 14 Training Planes. Veteran Flight Instructors prepare you for any Pilots Rating up to and including Transport.

Be an Aviation Mechanic. Learn Airplane engine maintenance, overhaul, and repair. Airplane construction: Sheet Metal, Welding. Training prepares you for your Government Mechanic's License. **Train now at Lincoln.** Be ready in a few months for a Good-Pay position in Aviation. Employment Service given on Graduation. **Write Today for complete information.**

LINCOLN AIRPLANE & FLYING SCHOOL
505 Aircraft Bldg., Lincoln, Nebraska

Pursuing The Postmark

[*Continued from page* 70]

abroad" markings, for instance, chronicle the permeation of one nation into another nation for the establishment of what we refer to as "Zones of Influence." Other postmarks reveal other history. The first-day cover definitely indicates the first day of use of a new postage stamp through its dated cancellation mark. Sometimes, in addition, you will find the helpful inscription, of "First Day Of Issue" in the obliteration lines. At least insofar as U. S. issues are concerned.

Among the more popular postmarks are those which bear slogans, or advertising inscriptions. Postmarks are not available to commercial advertisers, but the governments of many nations utilize the postmark to broadcast their services. An example to point is Switzerland, which (as with several other countries) operates and owns its own telephone system. Therefore, the Swiss government will advertise through postmarks, "Telephone Saves Time and Money," or some similar inscription. The Irish Free State, in broadcasting messages to its people, has also used the postmark. One of these sloganized postmarks reads, "Grow More Wheat," as illustrated.

There are also postmarks of an historical nature which advertise fairs and expositions and such undertakings. Quite a number of such items are in existence. All of these postmarks, no matter what group, are always more worthy when on full envelopes (covers), rather than cut from the envelopes. Wherever possible, such covers should be saved in their entirety.

At any rate, the pursuit of the postmark is pleasing. The more different types and groups one obtains, the more enthusiastic one becomes. Domestic and foreign are available, and each collector may select one group or generalise. Sometimes a postmark cannot be discovered upon full cover; or it is too expensive for the average enthusiast. Probably it may be had off cover, as a "cut square." These should be saved, but if a postmark is available, somewhere, upon full cover, it is worthwhile striving to obtain it. Such an item not only shows, conclusively, that postal duty has been faithfully performed; it also shows where the postal duty has been performed.

Hints For The Fisherman

[*Continued from page* 90]

creation. Several are illustrated herewith which will be found very effective and cost practically nothing to make. Figure 3 shows a minnow made of bacon rind. The "minnow" can be cut to any size from 3 to 12 inches, depending upon the size and kind of fish one is after. Muscallonge, great northern pike, and large mouth bass will take a bait half their own size. The lure can be used with or without a spoon. In some waters where baby-catfish, mudpike, and eels are the chief prey of the game fish, it is well to darken the fatty side of the bacon rind by dipping the rind in a strong solution of potassium permanganate. It will then take on a purplish iridescent hue which is particularly attractive. The drawing shows the details of the hook rig-up. This lure can be used either for trolling or for casting.

This plate also illustrates a lure which is very effective for bass and for wall-eyed pike in rivers of the Atlantic watershed. "Lamper" eels come up most of these rivers to spawn, and the baby eels are the prey of all the other fish. Eels for live bait fishing are very difficult to get. They bed themselves in the black sand of the river bank and are as quick as proverbial "greased lightning." But an "eel" made of bacon rind dyed with permanganate will fool the wisest wall-eyed pike. If used for trolling, it is well to use a small spoon on the head of the "eel."

There is also shown a "wet" fly which is a very effective "killer" for trout when the water is slightly discolored. This is especially effective in streams tributary to the Missouri River. When the water is discolored or high, the trout are on the lookout for little ringed worms commonly caller "rock worms." A black hackle can easily be remodelel to give a fair representation of these worms. The drawing explains the process. Celluloid cement will secure the woollen yarn to the shank of the hook which should be a No. 8 or 10.

A simple tool which every fisherman should carry consists merely of gluing a strip of fine emery cloth to both sides of an old nail file. A keener point can be put on a hook with this tool than with a file. A sharp point is essential for fly casting, because the hook cannot be "set" into the fish with a hard jerk.

Varnish-rubber's felt serves conveniently for applying line dressing. A piece about ½ by 1 by 1½ inches is split half through and the opening is impregnated with the dressing. Cold cream—the greasy kind—makes a good dressing for soft enameled lines. It will make the line float for the "dry" fly fisherman, and leaves no iridescent, oily film on the water.

Every fly fisherman should carry a small piece of chamois with him. It serves better than anything else for dry-wiping a line. Before using, the chamois should be soaked in water and then be wrung out dry.

Flies, black gnats and pesky mosquitoes often detract from full enjoyment of a fishing trip. There are nasty, irritating dopes on the market which will keep them away. But using these dopes is like hanging a man to cure a sore throat. A simple means of eliminating the insect nuisance is to cut a discarded enamel line into 6- to 8-inch lengths and hang the pieces around the brim of the fishing hat. The natural movement of the head will keep the flies "shooed" away. Soft, undressed line will not prove satisfactory, as the strands will become tangled. Enamel line will not tangle.

When a creel becomes aged it takes a dark brown color which absorbs the heat rays of the sun. Sensitive brook trout may spoil in a few hour's time in the hot interior. Every fisherman should carry a small towel so that the fish slime on his hands is not carried to the cork grip of the rod. If this towel is white and is kept damp, by draping it over the creel, the fish can be kept cool and fresh.

In hot weather, reasonable care must be exercised if one is to arrive home with a fresh and attractive catch. The best means of preserving trout is to clean them immediately upon catching. Then wipe them dry as possible with a towel from which all water has been wrung out. Wrap each fish individually in a piece of waxed paper and twist up the ends. It is well, too, to place a little green grass or wrinkled waxed paper in the inside of the fish to keep the sides apart. Upon returning to camp, each wrapped fish can be held momentarily over a flame to melt the wax. When the wax rehardens, the fish is in a practically air-proof container. They can be carried home and are sure to be in good condition when the cook is ready to fry them.

A final word! Make your fishing truly a sport. Don't judge your good time by the number of fish caught. Keep track of your "batting average." Ten "strikes" and seven fish in the creel is more commendable than sixty "strikes" and thirty fish in the creel. Don't go out after fish. Go fishing.

Psychologist Uses Radio To Check Hams' Personalities

CAN you judge a man's personality from hearing his voice over the radio? The possibility is being tested by a psychologist who is also a "ham" with his own radio transmitter in his study, Dr. E. Lowell Kelly, of Connecticut State College.

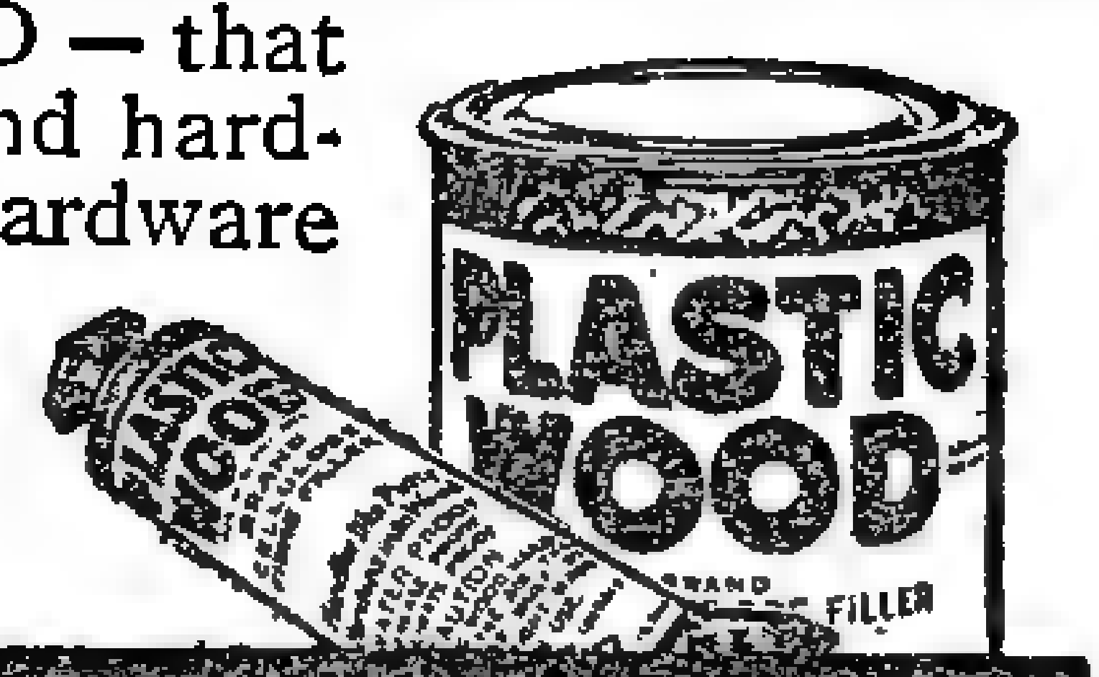
Fifty other amateur radio fans will take part in the experiment. Each of them will be rated on 36 different personality traits by personal acquaintances and also by those who know him only by radio. Comparison of the two ratings will reveal to what extent a man's personality "gets across" through the medium of the microphone.

Intelligence, sociability, popularity, initiative, courtesy, cooperativeness, culture, honesty and disposition; these are among the traits to be evaluated on Dr. Kelly's 36-point scale. If the experiment demonstrates that radio does reveal the personality, another experiment will be undertaken with those amateurs who use only code.

WITH P.W. I'LL PUT THAT ON TO STAY

RESULTS ARE AMAZING

Now if you have a **broken chair—loose caster—crack or nick in woodwork, floor, plaster or tile—loose drawer pull** —do a quick, expert job of repairing with wood in cans — PLASTIC WOOD — that handles like soft putty and hardens into wood. Paint, hardware and 10¢ stores sell PLASTIC WOOD in 10¢ and 25¢ tubes and 35¢ cans. Try it today.



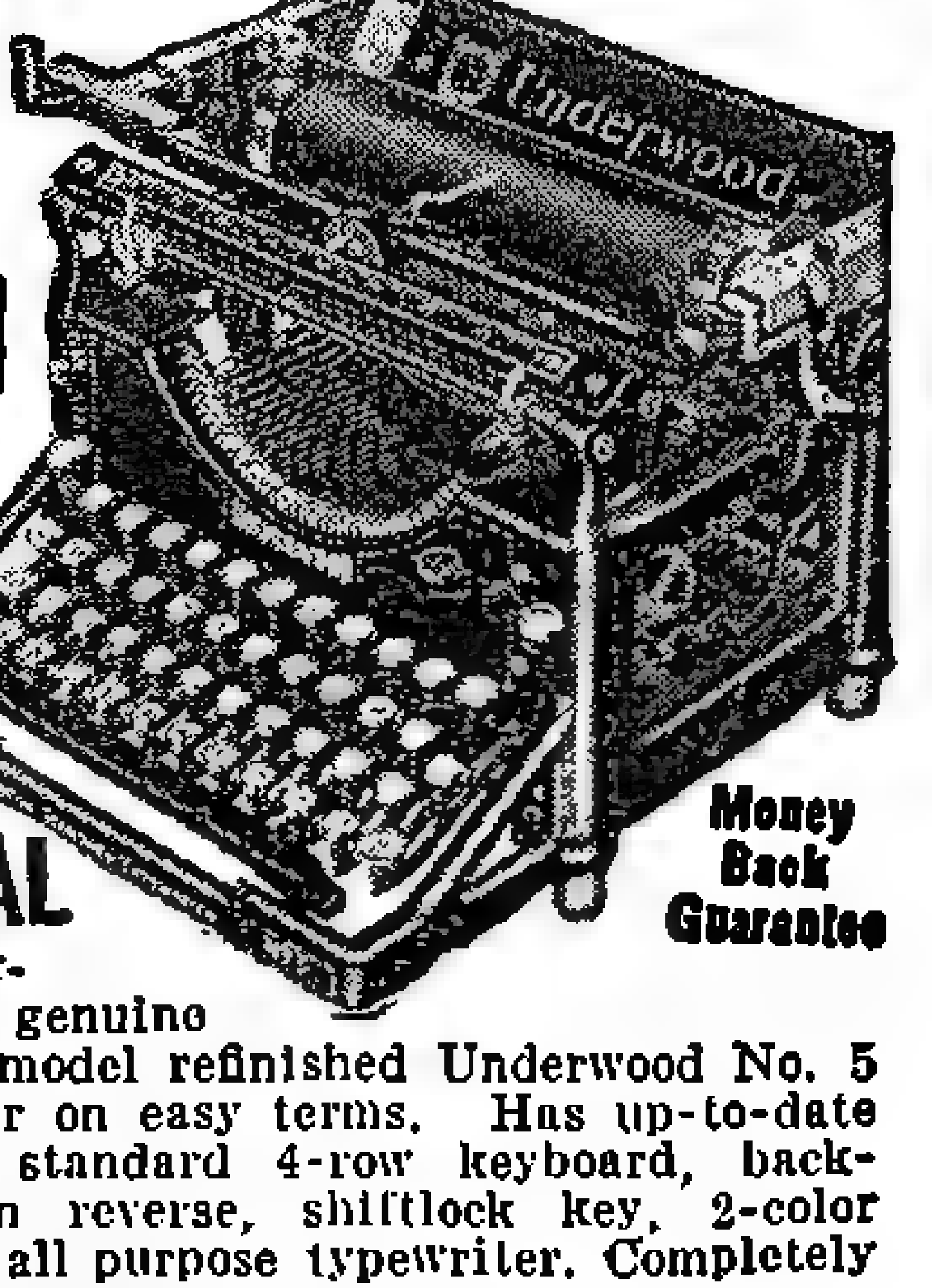
PLASTIC WOOD

MAKE MONEY IN YOUR WORKSHOP
Build furniture, auto trailers, canoes, iceboats, cruisers, sailboats and electric refrigerators described in
FREE BLUEPRINT BOOKLET
MODERN MECHANIX PUBL. CO., Fawcett Bldg., Greenwich, Conn.

TYPEWRITER ½ Price

Yours for 10¢ a Day

Send No Money



Sent on 10 DAY *FREE* TRIAL

Money Back Guarantee

Positively the greatest bargain ever offered. A genuine full sized $102.50 office model refinished Underwood No. 5 for only $44.90 (cash) or on easy terms. Has up-to-date improvements including standard 4-row keyboard, backspacer, automatic ribbon reverse, shiftlock key, 2-color ribbon, etc. The perfect all purpose typewriter. Completely rebuilt and FULLY GUARANTEED.

INTERNATIONAL TYPEWRITER EXCHANGE
231 West Monroe St., Chicago, Ill., Dept. 505
Send Underwood No. 5 (F. O. B. Chicago) at once for 10 days' trial. If I am not perfectly satisfied I can return it express collect. If I keep it I will pay $3.00 a month until I have paid $49.90 (term price) in full. **For quick shipment give reference and occupation.**

Name ______________________Age ________
Address ______________________________
Town ______________________State ________

ALLIED
Everything in Radio
Allied Radio
CORPORATION
833 W. JACKSON BLVD CHICAGO
SPRING & SUMMER 1938

FREE

164 PAGE SPRING CATALOG

EVERYTHING IN RADIO AT LOWEST PRICES

Write today for ALLIED's big Spring Catalog—just off the press! 164 pages packed with everything **NEW** in Radio. 56 sensational new "KNIGHT" Radios, including Push-Button Tuning models at new low prices; latest Auto Radios; Phono-Radio Combinations; 6 volt-110 volt Farm Radios; sets for AC-DC, 6 volt, 2 volt and 32 volt operation at unequalled low prices . . . **Set-Builders' Kits** of all types from 1 to 14 tubes . . . **Amateur Gear** in all leading lines . . . Amazing new **Sound Systems** for every purpose, from 10 to 70 watts . . . **Test Equipment** for all servicing needs. And more than 12,000 parts—books, tools, etc. Everything you need in one complete book. Lowest prices, fastest service. SEND COUPON for Free new Catalog.

FREE PARTS LISTS—Write for Free parts lists for any kit described in this or in any other magazine.

SEND COUPON **ALLIED RADIO CORP.**

ALLIED RADIO CORP.
833 W. Jackson Blvd., Chicago, Illinois
Dept 6-E8

☐ Send me your FREE New Spring and Summer Catalog.

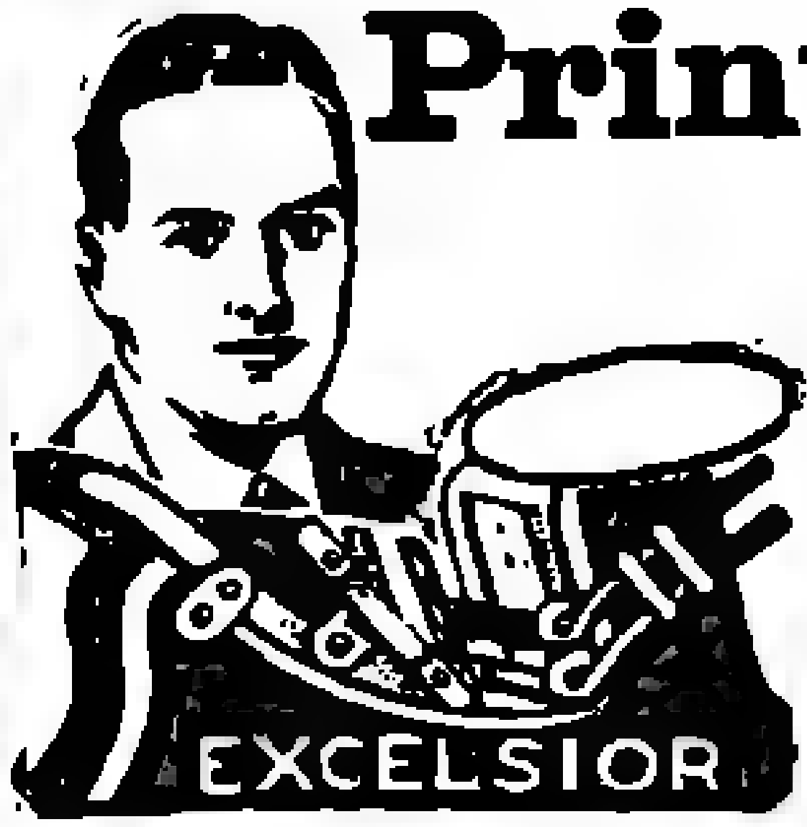
Name ....
Address ....
City .... State ....

PATENTS

PERSONAL SERVICE

My *Personal* service assures strictest confidence on all your patent problems. Send me a model or drawing, or sketch and description of your invention, and $5.00. I will make a search and report promptly as to its patentability and send you a copy of my 72-page booklet. Or, if you prefer to read my booklet first, write today for FREE copy. Registered Patent Attorney.

L. F. Randolph, 761 Victor Building, Washington, D. C.



Print Your Own

Cards, Stationery, Advertising, labels, paper, circulars, tags, etc. Save money and time. Sold direct from factory only. **Junior Outfit $9.00. Senior outfits $17 and up.** Do popular raised printing like engraving with any of our presses.

Print for Others, Big Profits

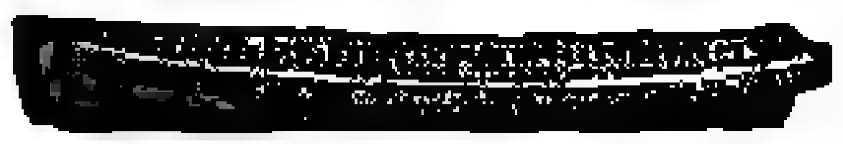
Pays for itself in a short time. Easy rules sent. Write for free catalog of outfits and all details.

KELSEY PRESSES, D-9 Meriden, Conn.

Thompson BEATS the World on BOATS

Better Built Lower Prices

Canoes $64 and up



Rowboats $42 and up

Outboards $42 and up

Very fast utility model

Only Boats With Full Length Spray Rails

Keep passengers perfectly dry—even at high speeds. Catalog also shows today's five most popular models of sailboats. Two big factories. Prompt shipment.

CATALOG FREE

Write for your copy. State kind of boat in which you are interested.

THOMPSON BROS. BOAT MFG. CO. (87)

230 Ann St., PESHTIGO, WIS. (*Write to either place*) 130 Elm St., CORTLAND, N. Y.

Men Behind The Stop Watch

[*Continued from page* 60]

gasoline tank was filled, locked, and the key handed to the A. A. A. observer. The car then rolled out of the garage to begin its leisurely drive from New York to San Francisco. Anxious to test the gasoline consumption at ordinary driving speeds, the pilot was in no hurry. Forty-five miles an hour was top speed. Fifty-one stops were made along the route to eat, sleep, refuel, or take pictures. At each refueling, the observer unlocked the tank, relocked it, and returned the key to his pocket. The whole trip consumed about 81½ hours' running time, although 102 hours were actually spent en route. A. A. A. men, computing from their records, found that in its 3114-mile run the car had averaged 21.421 miles to the gallon, consuming slightly more than 145 gallons of gasoline.

Still carrying A. A. A. observers, the car then turned its nose toward Muroc Lake—a natural race-course laid out upon a barren plain, miles in extent, smooth and bare as a billiard table. At 9:27 in the morning, with the thermometer standing at 118 degrees and no wind stirring, A. A. A. timers started their electrical timing system as the car rolled across the starting line. Gulotta and Hartz, well-known racing drivers, alternated during the gruelling 28-hour stretch.

Not a breeze drifted across the great tawny Mohave desert. Torrid waves of heat radiated into aching eyes and on blistering skins. Through the night, with torches marking the boundaries of the course, the car roared on, and on into the day. Finally a timer stepped to the edge of the course and raised a chalked sign above his head, notifying the driver to come in. As the car passed over the finish tape, A. A. A. officials took slide-rules and computed that a brand-new series of records had been established. Thirty-two old records had been shattered, many by as much as 10 miles and hour. The sedan averaged 80.88 miles per for the first ten miles, 74.74 over the entire 2,000 miles.

Practically all the important speed records of the present have been made with A. A. A. men computing the figures. Use of electrical timing mechanisms have made their computations sufficiently accurate to be used as standards of motorcar performance. Even the betting fraternity respects the races held under A. A. A. supervision, for they know that decisions will be fair and impartial.

Choose The Right Brush

[*Continued from page* 97]

a wide brush to finish inside a narrow or cramped space or the bristles may become ruined by such treatment.

Ordinary paint should be worked into the pores of the work, and for this reason professionals adopt a routine of brushing back and forth with the grain, until the paint is well distributed; then they work across the grain, and finish with light strokes with the grain. Like any other tool, a brush is subject to gradual wear; for this reason it should be turned occasionally so that the wear will be even and the shape preserved. Painting a very uneven or rough surface will wear down the bristles faster than if the surface had been properly prepared beforehand.

The method of applying varnish or enamel, which have similar characteristics, is quite different; the finish is flowed onto the surface instead of being worked into it. Do not make the mistake, however, of trying to flow a number of coats on at one time; a number of thin coats result in a much more presentable and durable finish. It is in varnishing and enameling that the dusting brush shows its great value. Use it to clean all loose particles of dust from the work immediately ahead of the brush, and to clean out corners and crevices. Also, if particularly clean-looking work is desired, work all loose bristles from the brush beforehand, and soak it overnight in a cup of varnish.

It has been mentioned that professional decorators think of the purchase of a high quality brush as an investment, for they expect it to give good service for a long time. The investment is protected, however, only when the brush is given careful treatment, and particularly important is the care used in cleaning it after it is used each time. More good brushes are ruined by lack of cleaning, or by improper cleaning, than will ever be worn out by amateur decorators.

One cause of brush failure is the entrance of moisture into the inside of the bristles, as this quickly softens them and removes the elastic springiness that makes for good work. Keep it in a dry but not warm place, inside its keeper if one was provided when you made the purchase. An excellent keeper can be made by folding a sheet of Cellophane around the brush, folding up the end and snapping it in place with a rubber band. This protects it from both dust and moisture, and at the same time keeps the bristles nicely in alignment.

Do not submerge the binding of the brush in the paint, and never allow the ends of the bristles to rest on the bottom of the can.

Turpentine or gasoline can be used to clean a brush of ordinary paint, but many professionals prefer ordinary gasoline (and not the kind containing lead) because it is less expensive and evaporates more rapidly. The important point is to wash all of the paint from the brush and from each individual bristle. Your good brush will not last if you do not. A good method is to use a coarse comb to separate the bristles up near the heel (next to the binding) so that the gasoline can enter freely. If old paint is allowed to accumulate in the heel, the bristles eventually will spread out. After it is thoroughly clean, whisk it about and use the comb to line up the bristles in case they are not straight.

If you do not intend using a brush for a considerable period of time after cleaning it, a good plan is to anoint the bristles with light lubricating oil. This will keep out moisture and preserve the suppleness, and the oil can easily be removed with gasoline when you wish to paint again. Some decorators wash their brushes with soap and water; it is not a practice to be recommended, but if it is done at all a good mild soap, such as soap flakes, should be used. Be sure to dry the brush thoroughly before putting it away.

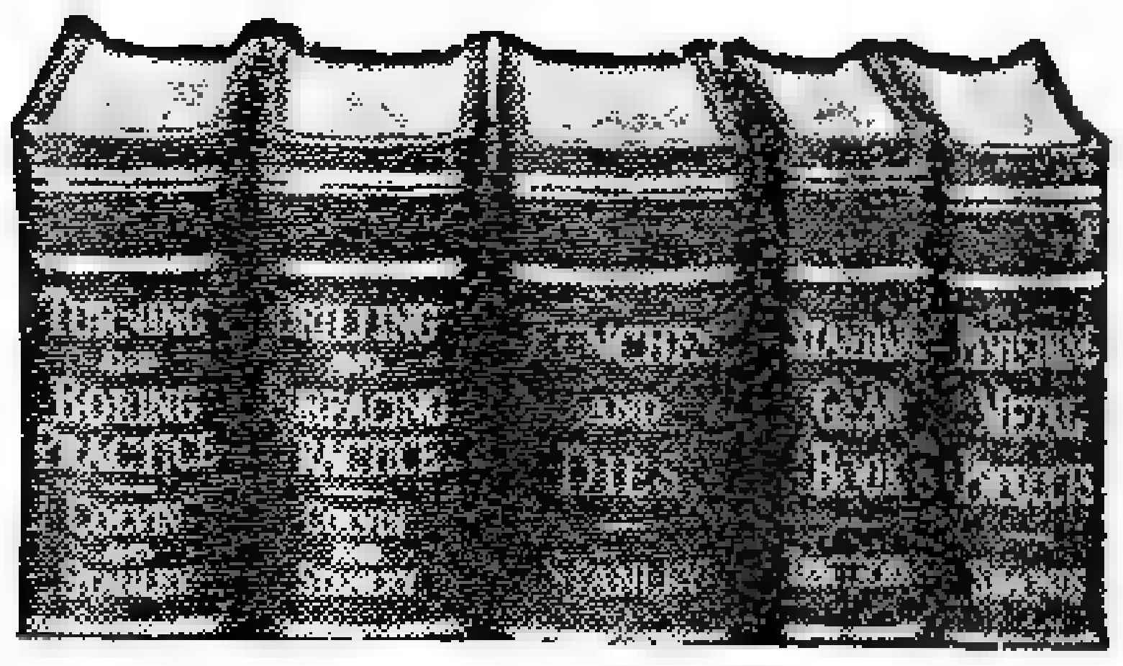
Varnish and enamel brushes should be cleaned with turpentine as gasoline has a tendency to curdle some types of varnishes, making the substance very difficult to remove. Be sure to dry out a turpentine-cleaned brush thoroughly before using it again, as the small amount of solvent remaining in the heel would otherwise cause the varnish to bubble and foam in the brush as it is being applied. Alcohol is the proper cleanser for shellac brushes, and it can sometimes be used for those that have been used for lacquer, although the regular lacquer thinner is safer. Be very careful not to clean a brush near an open flame. If it is necessary to clean brushes quite often, a good plan is to keep the solvent in a container that can be tightly closed. Between cleanings the paint material will have settled and the clear solvent can be poured off, to be used over and over again.

Kalsomine brushes should be cleaned in a solution of one part vinegar and two parts of water, and this is also useful as a dip when the brush is to be unused for a short length of time. The action of the vinegar is to neutralize the alkali of the finishes of this type, which would otherwise attack the bristles.

NOTICE

Changes in the make-up and title of this magazine, designed to make your favorite publication better than ever before, will become effective with our next issue. Be sure and reserve your copy now. Our new name will be—"Mechanix Illustrated."

This MACHINISTS' Home-Study Course



helps men get ahead

Newly assembled—specially priced—these five recent books give you the practical facts on modern machines, up-to-date methods you need to advance in machine shop work. Take advantage of the other man's experience as found in books, to solve your problem, increase your efficiency, with the new

Library of Modern Machine Shop Practice

5 volumes—2000 pages—1600 Illustrations

(*A combined home-study course and reference library*)

This library of machine shop practice was written for practical men. It gives you the best methods for every kind of machine shop work. It deals fully with lathes, drills, and other machine tools and their operation, automatic screw machines, speeds and feeds, gear design and production, punch and die work, metal finishing, etc., etc. Plainly written—completely illustrated—the best kind of help to the machine-shop man who wants to advance himself.

No money down—special price—easy payments

FREE EXAMINATION COUPON

McGRAW-HILL BOOK CO., Inc., 330 W. 42nd St., NEW YORK, N. Y.

Send me for 10 days' free examination the Library of MODERN MACHINE SHOP PRACTICE. If satisfactory I will send $1.50 in 10 days and $3 monthly until the special price of $16.50 is paid. If not wanted, I will return the books postpaid. (To insure prompt shipment write plainly and fill in all lines.)

Name______________________________

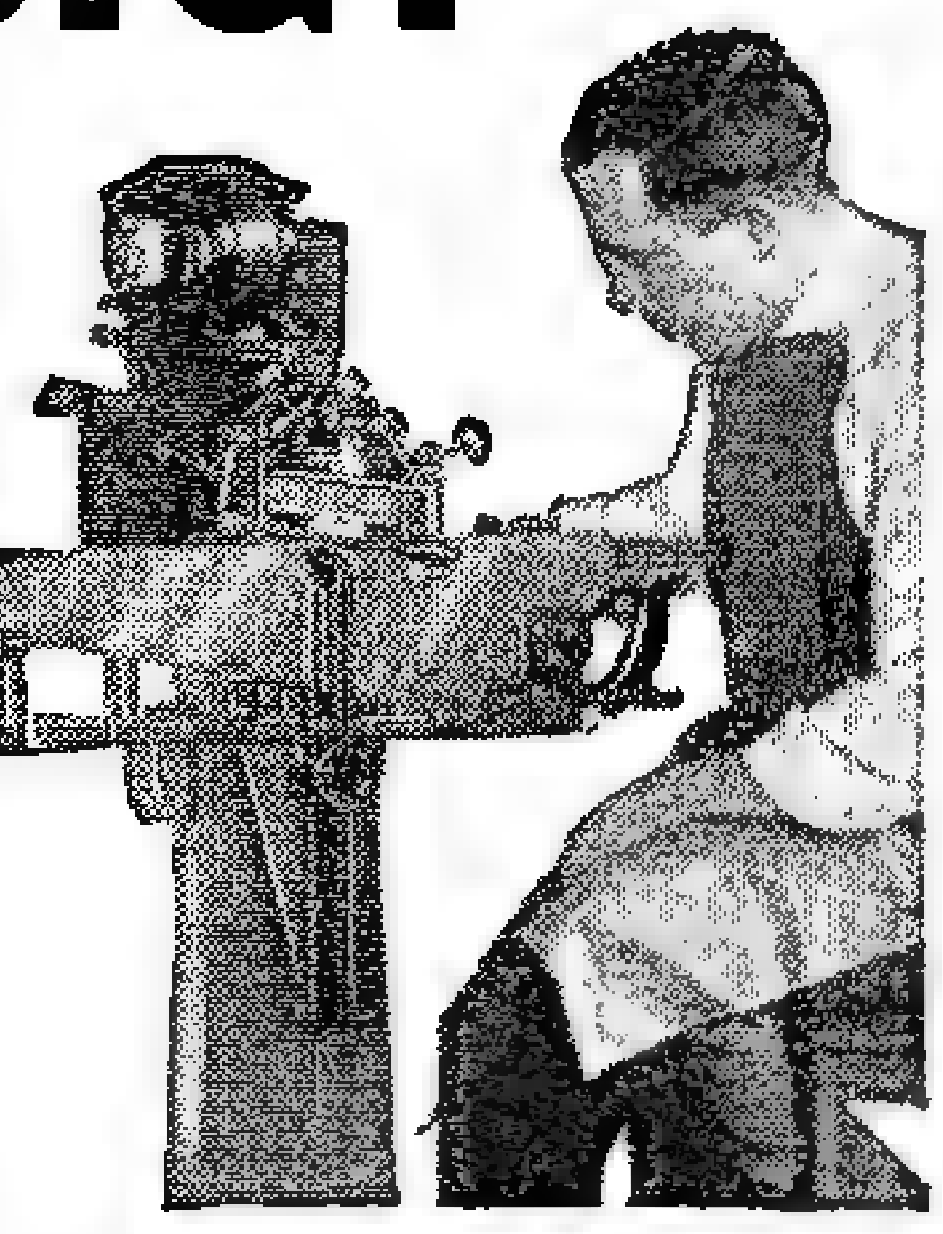
Address______________________________

City and State______________________________

Position______________________________

Company________________________ MMx-5-38

Saw-Filing PAYS BIG!



An opportunity to earn up to $2 to $3 an hour in your own cash business. Start in spare time at home. No experience required. You can do expert work...easily, quickly, without eye-strain, with a

FOLEY AUTOMATIC SAW FILER

"I have filed 765 saws in spare time and have earned $850.00 in carpenter work due directly to my saw filing contacts," says Louis P. Wadowick, Ohio. "Am still operating my Foley Filer after 5 years. Business better than ever this year," writes J. W. Veith, Pa.

The Foley files ALL kinds of hand saws, band saws and cross-cut circular saws BETTER than expert hand filing—every tooth exactly uniform in size.

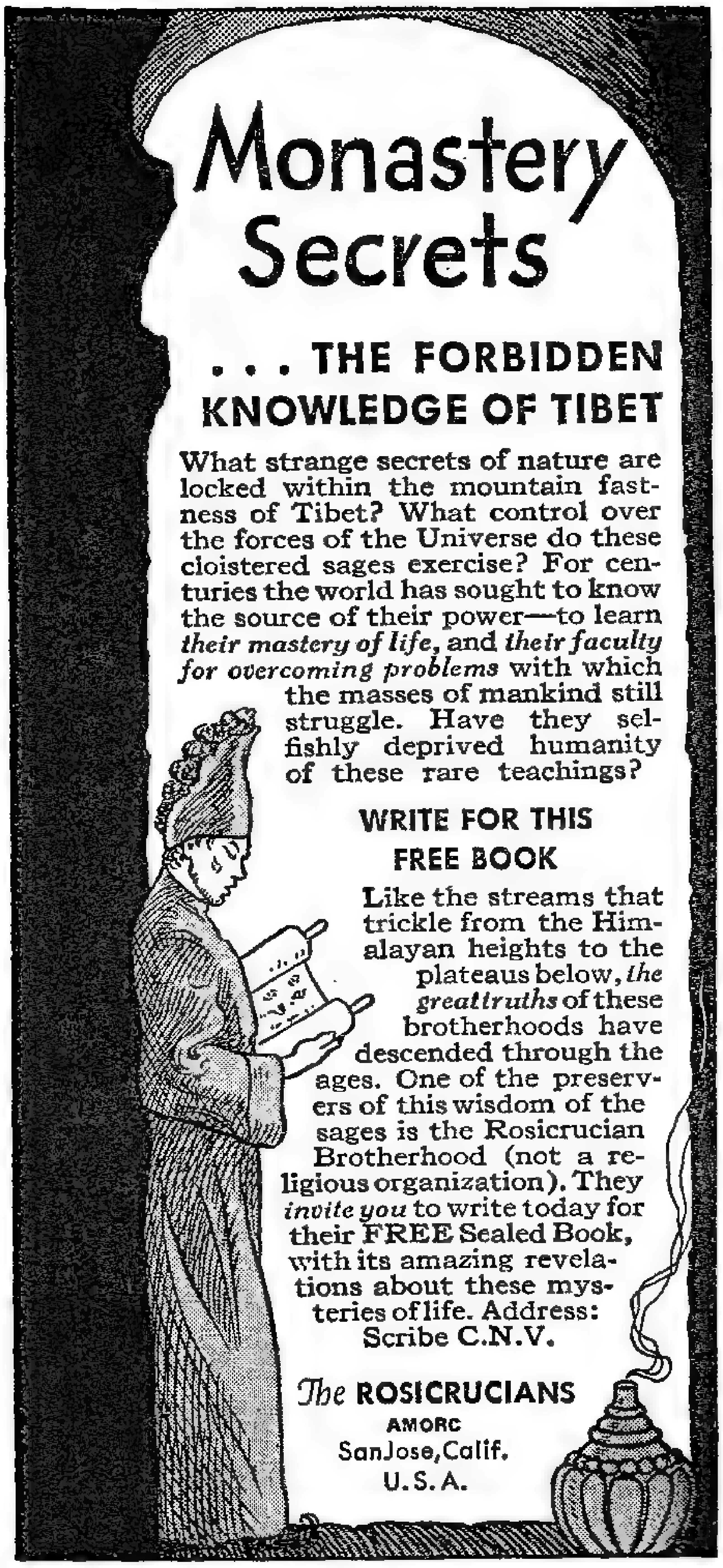
FREE PLAN shows you how to start—no canvassing. Send coupon now—no obligation, no salesmen will call.

FOLEY MANUFACTURING CO.
506-8 Foley Bldg., 11 Main St., N. E., Minneapolis, Minn.

Send me FREE PLAN, for starting my own business in spare time filing saws on the Foley Automatic Saw Filer, without obligation to me.

NAME ....

ADDRESS ....



Monastery Secrets

. . . THE FORBIDDEN KNOWLEDGE OF TIBET

What strange secrets of nature are locked within the mountain fastness of Tibet? What control over the forces of the Universe do these cloistered sages exercise? For centuries the world has sought to know the source of their power—to learn *their mastery of life*, and *their faculty for overcoming problems* with which the masses of mankind still struggle. Have they selfishly deprived humanity of these rare teachings?

WRITE FOR THIS FREE BOOK

Like the streams that trickle from the Himalayan heights to the plateaus below, *the great truths* of these brotherhoods have descended through the ages. One of the preservers of this wisdom of the sages is the Rosicrucian Brotherhood (not a religious organization). They *invite you* to write today for their FREE Sealed Book, with its amazing revelations about these mysteries of life. Address: Scribe C.N.V.

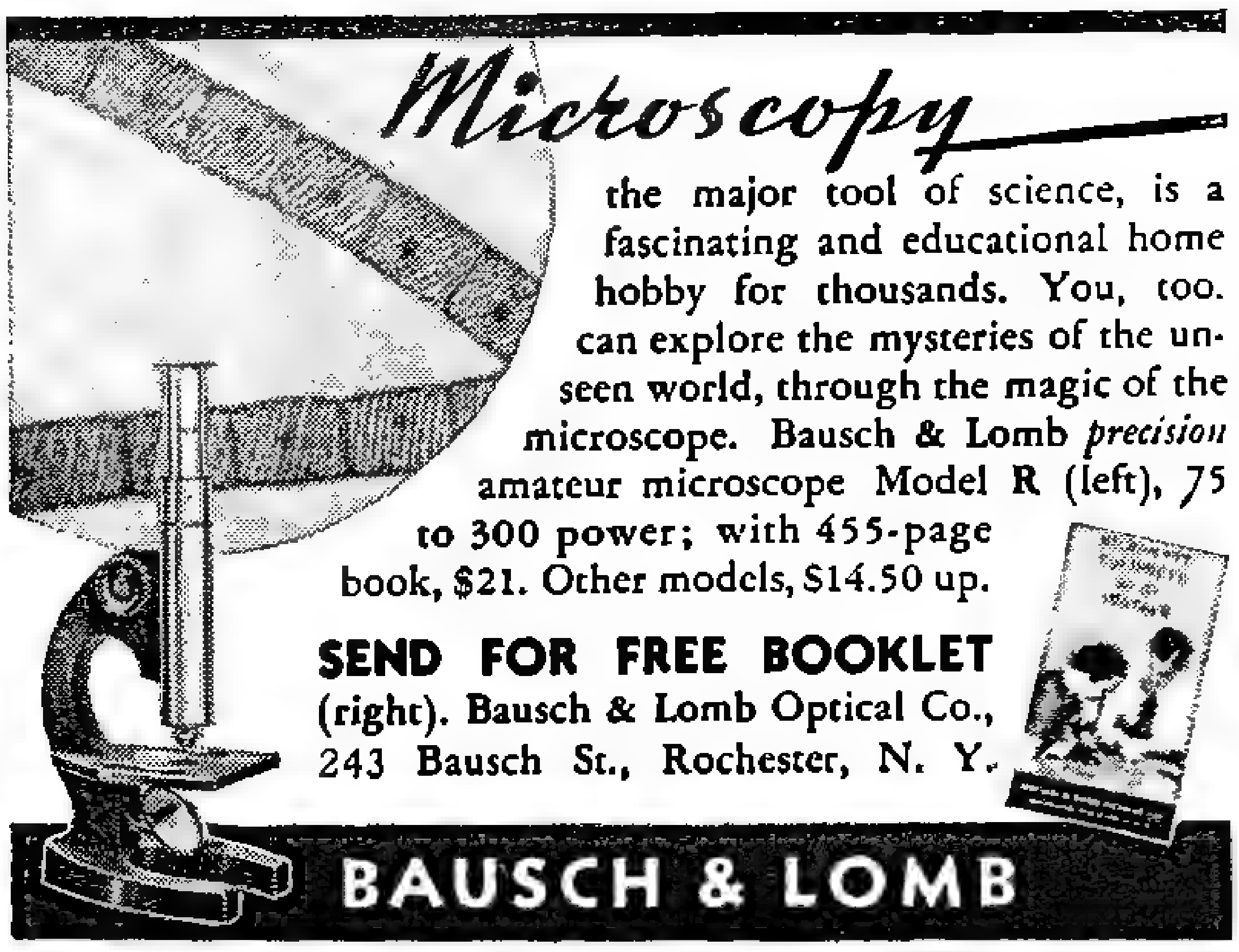
The ROSICRUCIANS
AMORC
SanJose, Calif.
U.S.A.

EARN MONEY

Make Color-glazed Concrete Products

New, perfected low cost method. No molds, power or costly tools. You build your own equipment from plans we furnish. Experience not necessary to make color-glazed concrete garden pottery, statuary casting, giftware—in home or shop—to earn money. MEN—Send 10c TODAY for booklet, colorplate, details of this money making business. No obligation.

NATIONAL POTTERIES COMPANY
Room 8, 13 W. 26th St.
Minneapolis, Minn.



Microscopy

the major tool of science, is a fascinating and educational home hobby for thousands. You, too, can explore the mysteries of the unseen world, through the magic of the microscope. Bausch & Lomb *precision* amateur microscope Model R (left), 75 to 300 power; with 455-page book, $21. Other models, $14.50 up.

SEND FOR FREE BOOKLET (right). Bausch & Lomb Optical Co., 243 Bausch St., Rochester, N. Y.

BAUSCH & LOMB

Cut Sections For Microscope

[*Continued from page* 86]

if it does not work freely, lap it to fit with valve-grinding compound.

A radio dial of suitable size and marked into 100 divisions can be purchased cheaply; or it can be turned on a lathe. Dividing the circumference into 100 divisions is not difficult. Lay it out on paper first, quartering a circle with two diameters at right angles to each other. Use a pair of dividers, and by trial and error divide each quarter into five divisions, then each of these in turn into five. Stick a pin into the center of the drawn circle, lay a steel rule against this pin and draw lines from each of the 100 marks in to the center.

Now affix the paper circle to the wooden dial temporarily with rubber cement and mark the divisions on the wood with a very sharp pencil. Remove the paper and give the dial two coats of shellac. The dial is now mounted on the end of the screw-rod, using care to get it just at a right angle so that it will not wobble when turned.

To the other end of the wooden block is fastened a metal or plate glass piece drilled to fit tightly around the brass tube, which is then cut and filed to be precisely flush with the plate's surface. Glass is best for smoothness and flatness and may be drilled by another length of the same brass tubing used in making the microtome well. A very thin film of Plasticene modeling clay may be employed to hold the plate to the wood; this permits some adjustment should trial cuts prove that the plate is not at an exact right angle to the tube, which it must be. Various cements may also serve.

It can now be seen that when a specimen is placed in the tube and the dial turned so as to bring it to the surface ready for sectioning, a turn of one division on the dial will push the specimen upward by 1/100th of the thread of the screw-rod. If this is the usual ¼x20 bolt, the movement will be 1/100th of 1/20th of an inch, which is 0.0005 inch; if finer threads have been used, then it will be 1/100th of however many threads there may be to the inch. On the model photographed it was perfectly possible to estimate ½ of a division, thus reducing the movement, and hence the thickness of sections cut by this instrument to 1/200th of the thread. By such means one can tell fairly accurately the thickness of his sections.

During the cutting process, this well microtome may be held in the left hand and the razor manipulated with the right, as described for free-hand sectioning. It will be better, however, to place the block on a table, hold it steady with the left hand and cut with the right hand in the fashion of chopping, using a sliding stroke, from toe to heel of razor and taking care to keep the blade pressed against the cutting plate.

The measurement of extremely small dimensions, as seen under the microscope, constitutes the science of *micrometry,* and the unit of measurement is the *micron* (plural, micra), abbreviated by using the Greek letter mu (equivalent to our m). This is one-thousandth of a millimeter (0.001 mm) which in turn is one-thousandth of a meter. A meter is 39.37 inches, hence a millimeter is 0.039 inch and a micron is 0.000039 inch, a very minute measurement indeed! Routine machine microtome sections, in schools and hospital laboratories are customarily cut at 10 micra; those to show detailed parts of cells, at six, five or even less. It is perfectly posible, with the best equipment and a certain amount of skill that comes with practice. to cut sections as thin as a single micron.

Hand microtome sections may be cut as thin as 10 mu but more often are thicker and free-hand sections are almost always considerably thicker. This does not mean that they are inferior to machine cuts, for it is not always desirable to have sections as thin as 10 mu; it all depends on the material being sectioned and the purpose for which the sections will be studied. For the general anatomy of plant buds, stems, roots and many other items, sections of 25 mu may surpass thinner ones in explaining relationship of parts and the structure of the object as a whole.

If the hand microtome is used, the material must be held firmly in the well and against the bottom plate, so that turns of the dial will push it upward for successive cuts. Large objects are trimmed down to fit in the well and then they, as well as all smaller materials, are surrounded and supported with certain packing material, including strips of wood pith, raw carrot or turnip, or hardened beef liver. Strips of beef liver measuring something like two inches in length by one-half to three-fourths of an inch each in breadth and thickness are placed in alcohol for 24 hours, then transferred to fresh alcohol and kept until needed; this renders the liver suitable as to hardness.

Place any of these fillers in the well, surrounding the object and reinforcing it, and reaching to the bottom of the well, leaving no waste spaces. The filler is cut along with the object, but separates readily when the whole section is floated in water. For very small objects—and many technicians prefer the method for all objects—*imbedding* is necessary. Use a mixture of three parts of melted paraffin, any of the commercial brands used for sealing jelly glasses, to one of vaseline, thoroughly stirred together while heated just enough to keep the paraffin melted. Do not "cook" the mixture; the warming is best done on a slide dryer or over a radiator, an electric bulb inside a ventilated tin can, or other source of mild heat.

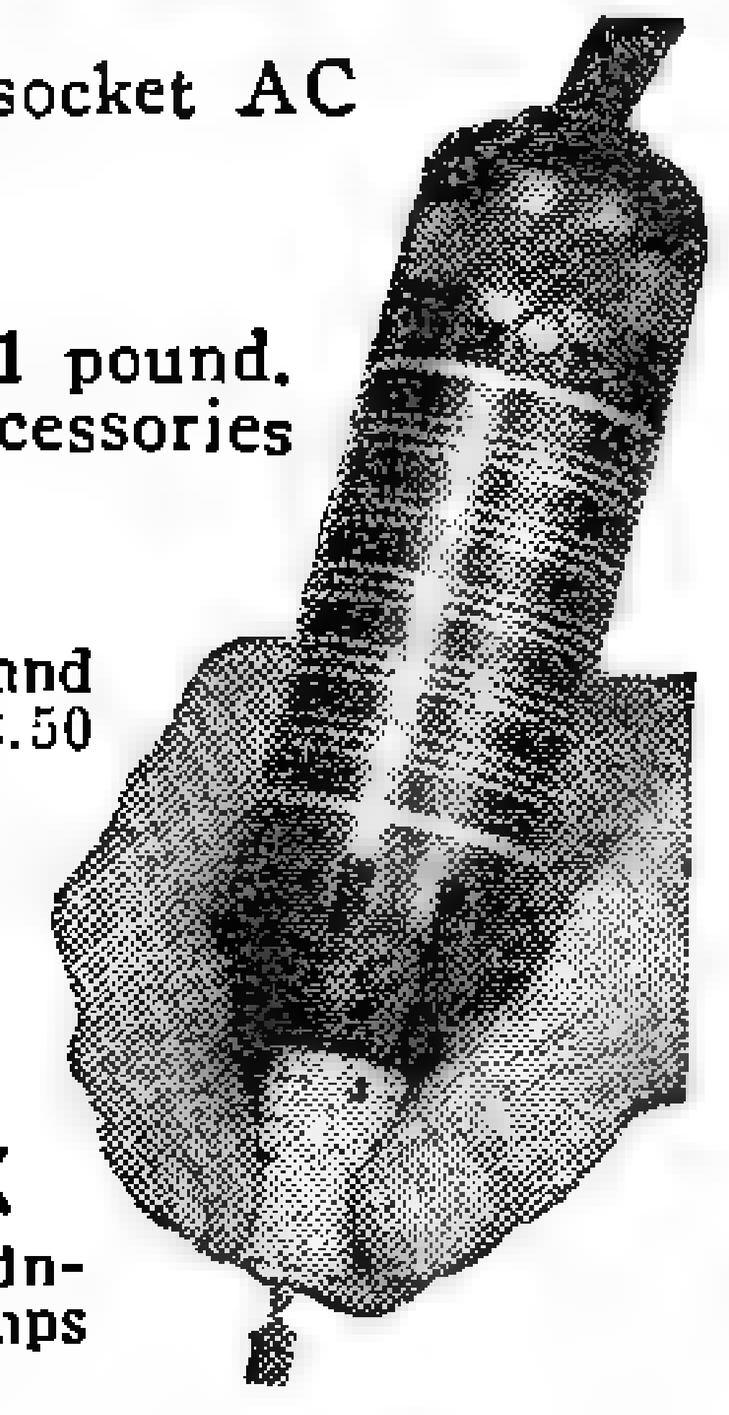
To imbed a tree bud, for example, warm the microtome first then fill the well with the melted imbedding mixture; blot the bud or dry it on a cloth should it be wet, and when the paraffin has

[*Continued on page* 141]

I'M READY TO USE... INSTANTLY
LEPAGE'S
strength
LIQUID GLUE

You get the same uniform strength in bottle, tube or can of LePage's—standard throughout the world. The economical fixer.

For Faster Better Jobs



HANDEE

Tool of 1001 Uses

A WHOLE SHOP FULL OF TOOLS IN ONE

For work on all metals, alloys, bone, resins, plastics, glass, stone, wood, etc. Uses 200 different accessories to grind, drill, cut, carve, sand, saw, engrave, sharpen, clean, polish, etc. Saves hours of tedious hand work. Plugs in any socket AC or DC, 110 volts.

STANDARD MODEL

A sturdy little helpmate. Weighs 1 pound. 13,000 r.p.m. $10.75 postpaid, 3 Accessories Free.

DE LUXE MODEL

Fastest, most powerful tool of its type and weight, 12 ounces. 25,000 r.p.m. $18.50 postpaid, 6 Accessories Free.

GET A DEMONSTRATION

at your Hardware, Department or Tool Dealer or order either Model on 10-Days, Money-Back Trial. Catalog Free.

CRAFTSMAN'S PROJECT BOOK

Easy working plans for making many interesting and unusual projects, 25c stamps or coin.

Chicago Wheel & Mfg. Co., 1101 W. Monroe St., Dept. H, Chicago, Ill.

☐ $10.75 Model ☐ Project Book ☐ Send C. O. D.
☐ Send Catalog ☐ De Luxe Model
MMI-5
Name ....
Address ....

Classified Advertisements

Rates for classified ads, 18c per word (include name, address and all numbers), per insertion. Minimum 10 words. Cash must accompany order and be received in this office April 1st for the June issue (on sale May 4th). Address Classified Mgr., Modern Mechanix Hobbies & Inventions, 1501 Broadway, New York City.

A. C. GENERATORS

ATTENTION Bargain Hunters! Factory rewound 110 volt, 60 cycle A.C. generators, 175 to 1500 watts. Also slow speed 6, 12 and 32 volt D.C. generators for wind light plants and wind chargers. Sold for rewinding costs. Guaranteed. Monroe Mfg. Co., Box 3343, St. Paul, Minn.

PRACTICAL changes for automobile generators. A. C. and D. C. generators, motors and welders. Complete wind and water power plants. See our advertisement at bottom of page 11. Autopower.

A. C. Generators, hand-driven, generates 110 volts, original price $5.50. Special 98c. Electrical Salvage, Box 524-81, Lincoln, Nebr.

ADVERTISING AGENCIES

YOUR Ad in 1,500,000 Sunday Newspapers (guaranteed, national circulation) $15.40 inch. Rate-book all leading newspapers, magazines. Free. Chicago Advertising Agency, 20-M West Jackson, Chicago.

ADVERTISE: 24 words in 250 Newspapers $10. Lists Free. Advertising Service Bureau, 4515-B Cottage Grove, Chicago.

33 WORDS, 25 Magazines, Three Months, $2.00. Goodall Agency, 742 Market, San Francisco.

FREE NEW advertisers rate guide. Brown Advertising Agency, 140 South Dearborn, Chicago.

AGENTS WANTED

AGENTS: Smash go prices! Santos Coffee 12c lb. 4-oz. Vanilla 8½c. Razor Blades 10 for 8½c. 100 Sticks Chewing Gum 12c. 150 other bargains. Premiums. Experience Unnecessary. Carnation Co., MN. St. Louis, Mo.

IF EARNINGS up to $45 first week will satisfy you, I'll send complete outfit to run home-operated Grocery Agency. Absolutely no money risk. Details sent free. Write Albert Mills, 6203 Monmouth, Cincinnati, Ohio.

PROFIT with new products. Make, sell, repeat. Analysis. Research. Guaranteed formulas. Biggest catalog free. Special prices, leads. Gibson Laboratory, Chemists, CE-1142 Sunnyside, Chicago.

BIG MONEY Taking Orders; Shirts, Ties, Hosiery, Underwear, Raincoats, Pants, Uniforms, etc. Sales Equipment FREE! Experience unnecessary. Write NIMROD, Dept. 132, 4922-28 Lincoln, Chicago.

BIG Money applying initials on automobiles. Easiest thing today. Free samples. Also, sideline salesmen for name plates and tire cover transfers. "RALCO", 1305 Washington, Boston, Mass.

MAKE Easy Money. Wonder Metal Polish. Exclusive Territory. Package makes half gallon, cost $1 dozen, sells $6 dozen. Sample 25c. A. A. Supply Co., 422 Turk St., San Francisco, Calif.

LARGE Profits in your own business. Sell new and used clothing, bankrupt stock. Experience unnecessary. Everything furnished. Details free. Publix, 558-KT Roosevelt, Chicago.

NO PEDDLING—free booklet describes 107 money-making opportunities for starting own business, home, office. No outfits. Elite Co., 214-G Grand St., New York.

1000 BARGAINS, Drygoods, Notions, Drug Sundries, Specialties, Novelties. Agents undersell stores. Free catalog. Jobbers, Dept. 2998A, 930 W. Roosevelt, Chicago.

WHERE To Buy At Wholesale 500,000 articles. Free Directory and other valuable information. Maywood MM. Publishers, 925 Broadway, New York.

BUSINESS Proposition Resilvering Mirrors. Autoparts, Reflectors, Making Chipped Glass Signs. Write Sprinkle, Plater, 850, Marion, Indiana.

BIG money applying initials on automobiles. Write for particulars and free samples. American Letter Company, Dept. 11, Dunellen, New Jersey.

500% PROFIT Selling Gold Leaf Letters for Store Windows. Free Samples. Metallic Co., 445 North Clark, Chicago.

ATLAS Window Sign letters. Large Sizes, Penny Each. Beautiful Free Samples. Atlas, 7941-G Halsted, Chicago.

MEXICAN Curios, tremendous moneymakers! Samples 10c. Marquez-M, Apartado 1176, Mexico City.

AIRPLANE ENGINES

CONVERTED two-cylinder Lawerance Aircraft Engine $60. Write for particulars. Albert Cartwright, 405 Whitney Ave., Fresno, Calif.

AMERICAN POLICE JIU JITSU

13 KNOCKOUT Blows without use of fists, by internationally famous Jiu Jitsu instructor. Send 15 cents. S. J. Jorgensen, 293 Maritime Building, Seattle, Washington.

ARC WELDERS

75-200 AMPERE arc welder from Dodge generator. Complete plans and valuable catalog 35c. 100 other generator changes. LeJay Manufacturing, 214 LeJay Bldg., Minneapolis, Minn.

ART MAGAZINE

ART MAGAZINE. Helps you sketch human figure, paint, model, carve, cartoon, sell drawings, exhibit, form clubs. Regular 50c value—two for 25c while samples last. Magazine, 320 West Doty, Madison, Wisconsin.

AUTOMOBILES

ECONOMY! Performance! Mileage! Semi-diesel conversions for gasoline motors, $5.00 up. Manufacturer's written guarantee. Learn basic facts from free literature. Houston & Logan Conversions, 1719 Addison, Berkeley, California.

AUTO SUPPLIES & EQUIPMENT

CONVERT your car to burn Diesel oil. Save up to 70% fuel costs. Cheap installation. Wonderful performance. Proven factory method. Different and better. Costs nothing to investigate. Write for free circular No. 5A. Harrington Company, 201-204 Manchester Building, Portland, Oregon.

AVIATION

GET Into Aviation. Air Transport pilots get up to $6,000 per year, mechanics $2,500. Learn at this Government Approved School. Write for complete information. State age. Lincoln Flying School, 4002 Aircraft Building, Lincoln, Nebraska.

FREE AEROPLANES with motor purchase at $149.95. Easy terms—$12.50 down. Aeroplane—sled Propellers $3.50 up. Sensational values. Illustrated information 25c. Universal Aircraft, Fort Worth, Texas.

AVIATION Apprentices. Good Pay—Big Future. Write, immediately, enclosing stamp. Mechanix Universal Aviation Service, Strathmoor Station, Dept. A2, Detroit, Michigan.

INEXPERIENCED workers, apply for aviation jobs now. Full salary while learning. Details for stamp. Airployment, Box 553, West Los Angeles, California.

HEATH Airplane, motor, propeller literature, dime. Heath Aviation Company, Benton Harbor, Michigan.

BLUEPRINTS

METAL TUBE Midget Radio, the last word in compact radio receivers. You can construct this set even though your knowledge of radio is limited by following the large pictorial blueprints available, from Modern Mechanix Publ. Co., Greenwich, Conn., at 50c postpaid.

MAKE your own 100% reverse gear from auto parts, $5.00. Arc welder from Radio Junk, $1.00. Current limiting device, $1.00. Krebs, 19 Wolcott St., Brooklyn, New York.

BOATS

LATEST Boat Sensation: New 20 lb. Mead Sportsmans Ki-Yak assembled at home easily, quickly from complete factory-cut kit. $6.00 paddle now given with yours—if you hurry! Rush dime for catalog with pictures, description i. e. Mead Gliders, Dept. MC-58, Chicago, Ill.

FORD and Lincoln Marine Conversions. Send 10c for information. Lehman Engine Co., Newark, N. J.

BOOKS & PERIODICALS

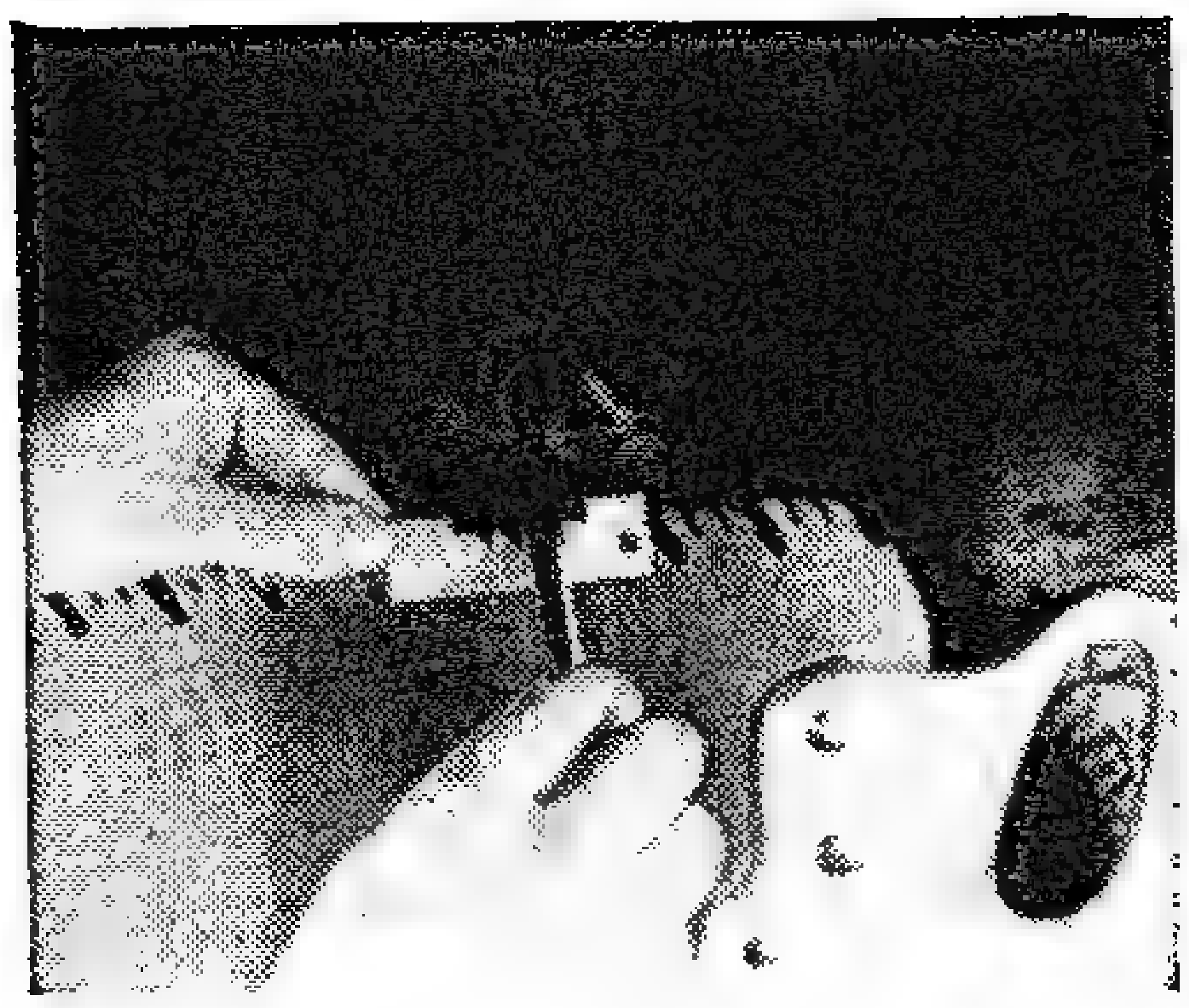
SPORTSMEN'S MANUAL—The outdoors man's guide containing scores of practical articles by America's leading outdoor writers, covering every phase of fishing, hunting, camping, and trapping. This book, edited by Robert Page Lincoln, will make that next vacation a dozen times more enjoyable. Price 50c at your newsstand, or order directly from Modern Mechanix Publishing Co., Fawcett Bldg., Greenwich, Conn.

JUST Published: 1938 Directory of Hobbies and Spare-time Opportunities. A guide for amateur and professional hobbyists. 25c per copy. Park City Book Supply, Dept. W, 1078 Pembroke Street, Bridgeport, Connecticut.

BUSINESS OPPORTUNITIES

GLASS-LIKE Color Glaze for concrete, pottery, tiles, blocks, walls. Exclusive, patented process. No experience needed to make 2,500 designs glazed pottery without molds. Build your own equipment from our plans. New, money-making business for men. Color-plate, booklet, details 10c. None free. Write. National Potteries, 13 West 26th St., Minneapolis, Minn.

Hand Saw Features Two Sets of Teeth



Designed for use as either a cross-cut or rip saw, a new hand saw produced by an Indianapolis, Ind., manufacturer has teeth that are somewhat larger than the usual variety and arranged in sets of three. Two of the teeth in each set are slicers, or cutting teeth, and the third is called a planer. The slicer teeth make the cut and the planer cleans it out and levels, preventing binding of the blade at any time. A suitable gauge (shown in use above) is provided with each saw so that anyone can file the teeth accurately without difficulty.

PLASTEX Industry needs manufacturers on small scale and for big production of Art Goods and Novelties in Plastex and marble imitation. Cheaply and easily made in our guaranteed rubber moulds. We cooperate in selling goods. You are just in time for big 1938 wholesale season now starting. Interesting booklet mailed free. Plastex Industries, Dept. R, 1085 Washington Ave., New York.

A BUSINESS for country or city, electric fire and burglar alarm. Profits galore. Directions, package equips five windows, one door, $8.00. Each additional openings thirty cents extra. Not including wire. Mention whether electricity is available. Hart Alarm Co., 3029 Lorain Ave., Cleveland, Ohio.

FASCINATING business. Repair, adjust typewriters, adding machines. Learn easily at home from factory expert. Earn up to $15.00 daily. Complete instructions covering all makes $3.00 postpaid or sent C.O.D. Adding Machine Equipment Service, 3601 Michigan, Dept. 2045, Chicago.

WE START you in business, furnishing Outfits and Instructions, operating "Specialty Candy Factory" home. Men and women, earn $25.00 up to $60.00 weekly, all or spare time. (Our 29th year.) Booklet Free. W. Hillyer Ragsdale, Inc., Drawer 110, East Orange, N. J.

MAN in Each Town to Plate Auto Parts, Reflectors, Bicycles, Fixtures, Mirrors, by late method. Simple plan of manufacturing at home starts You in Good Paying Business. Free particulars and proofs. Gunmetal Co., Ave. A. Decatur, Illinois.

MAKE artificial marble. Glazed tiles. uncanny. Tabletops, plaques, floors, hones, novelties. Hard, fireproof, inexpensive, cement secrets. Brilliant tile and liquid rubber samples 3c. John H. Payn, 945 Grande Vista Avenue, Los Angeles, Calif.

LIKE To Write? Earn extra cash! Clipping and preparing newspaper articles for publishers. Simple, fascinating, profitable, Stamp brings details. Division 76, National Press, 3923 West Sixth, Los Angeles, California.

COLOR concrete surface with chemical solutions. Beautiful pottery without moulds. Garden wishing-wells. Stucco rock. Glazing concrete. Sample 10c. Hollywood CementCraft, 8528 Wonderland, Hollywood, California.

PROFIT with new products. Make, sell, repeat. Analysis. Research, Guaranteed formulas. Biggest catalog free. Special prices, leads. Gibson Laboratory, Chemists, CE-1142 Sunnyside, Chicago.

IF YOU are looking for a chance to devote your spare or full time to profitable work see our offer on page 26. Metal Cast Products Co., 1696 Boston Road, New York City.

GREAT Money Making Opportunities. Start mail order business of your own. Spare time. Make money. Write. Process Co., 4437 N. Lincoln Ave., Chicago, Ill.

AFTERNOONS free for outdoors, movies. $340 month, home. Unique plan. No canvassing. Prepare for surprise. Folio-S, Station D, Los Angeles.

SUCCEED With Your Products. Make-Sell Them. Formulas. Processes. Accurate analyses. Catalog free. A. Thaxly Co., Washington, D. C.

IF YOU'D like an extremely profitable, lifetime business, operate a Collection-Credit agency. Free folder. Cole Associates, Syracuse, N. Y.

FREE LITERATURE describes hundreds plans for making money locally or by mail. Gilbert Supply, 1107-M Broadway, New York.

YOU'LL Like Resilvering Mirrors, Autoparts, Reflectors, Making Chipped Glass Signs. Write Sprinkle, Plater, 845, Marion, Indiana.

MERCHANTS attention. Proven sales ideas that bring real business. Send $1.00 for three. W. S. Finigan, Oneonta, N. Y.

PLANT Chemiculture. Instructions, 10 formulas, $1. Dawson and Dorn, 4615 W. Washington Blvd., Los Angeles.

AGENTS—To mail our literature. Good profits. Home business. M. Marwood, 149 Fifth Ave., New York.

SELL by Mail! Books, Novelties! Bargains! Big profits! Particulars Free! **H. Elfco, 438 North Wells, Chicago.**

EARN cash income, copying and duplicating simple cartoons for advertisers. 3-N Service, Argyle, Wisconsin.

HOW and where to obtain capital fully explained, free particulars. Star Service, Wapakoneta, Ohio.

WANTED—Columbus ball gum vending machines. Postal Box 1014, San Antonio, Texas.

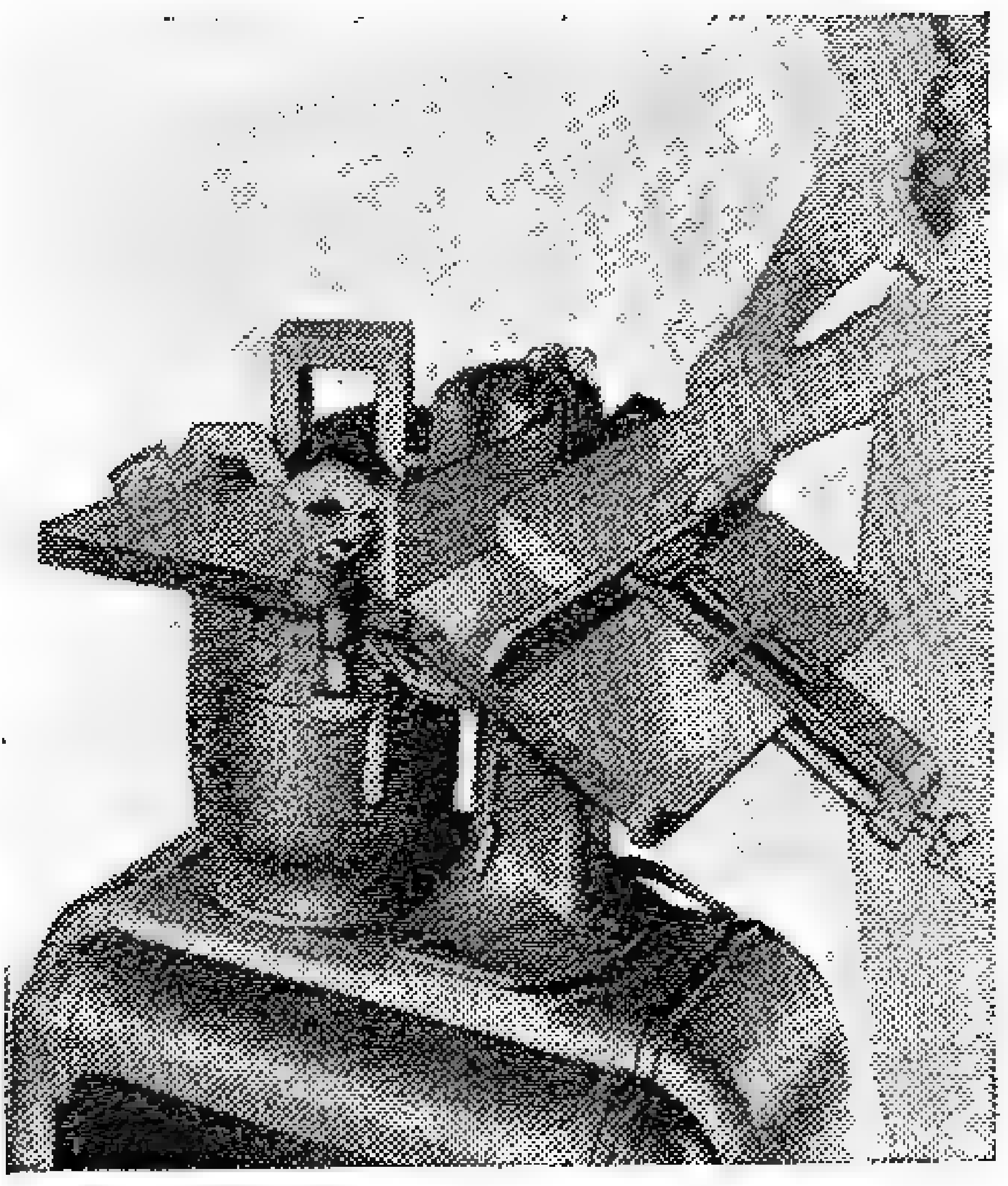
OPPORTUNITIES. Men, women. Literature. Silvester & Co., MM, Old Bridge, N. J.

107 NEW successful home business plans. Century, 1261-M Broadway, N. Y.

CAMERAS & PHOTO SUPPLIES

CAMERAS and supplies. Free illustrated catalog listing everything photographic—still and movie cameras, films, lenses—at tremendous savings. Hundreds of bargains, new and used. All guaranteed. We take your old camera or equipment in trade. Write now for your free copy of our newest money-saving bargain book—just out! Limited edition. Hurry! Central Camera Co. (Photographic Headquarters Since 1899), 230 South Wabash, Dept. 5-J, Chicago.

Shaper Features Tilting Table



Featuring a tilting table which is raised or lowered on an accurately ground column, a new shaping machine makes it possible to cut bevels and intricate moulding with standard shaper knives. Manufactured by a Wisconsin firm, the shaper can be had as a bench or floor type.

MAKE money in photography. Learn quickly at home. Spare or full time. Easy plan. Previous experience unnecessary. Common school education sufficient. Interesting booklet and requirements free. American School of Photography, 3601 Michigan Ave., Dept. 2049, Chicago.

INCOME From your camera instead of expense. Low cost home course teaches you to make photographs for magazines, newspapers, advertisers. Tremendous demand. Earn good money wherever you live. Free book. Universal Photographers, Dept. A, 10 West 33rd St., New York.

CASH for used cameras, lenses. Send for appraisal or describe fully. Miller Photo Service, Avoca, New York.

DUPONT Superior Panchromatic, 35 mm; 25 ft. roll, $1. Optical Laboratories, Larchmont, N. Y.

CHARTERS

DELAWARE Charters: Complete incorporating and organizing service $35. Submitted forms. Chas. G. Guyer, Inc., Wilmington, Delaware.

CHEMISTRY

EXPERIMENTERS—Join American Amateur Science League, West Chester, Pennsylvania. Particulars sent free.

CHEMISTRY, Mineralogy, Microscopes, Binoculars. Catalog Free. Teeko, 5315K, Evanston, Illinois.

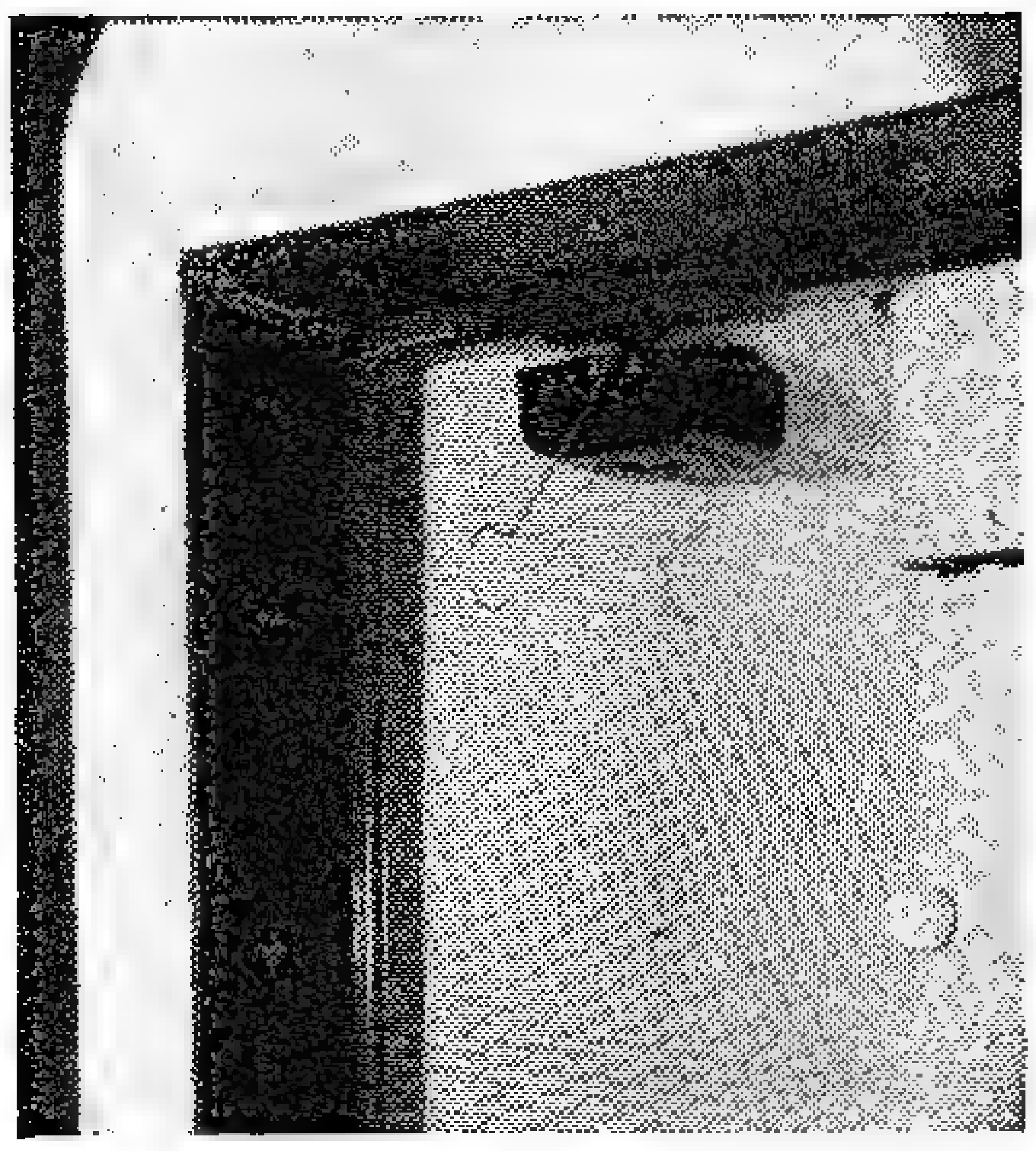
CORRESPONDENCE COURSES

500,000 USED Technical and business books. Sold, rented, exchanged. All subjects. Satisfaction guaranteed. Cash paid for used books. Complete details and illustrated bargain catalog free. Send name. Nelson Co., 3229 Manhattan Bldg., Chicago.

DETECTIVES

DETECTIVES. Make Secret Investigations. Experience unnecessary. Detective Particulars Free. Write, George Wagner, 2640-V Broadway, N. Y.

Refrigerator Light Operates on Battery



Designed for refrigerators operated by gas or using natural ice, this small battery-operated light unit can be installed in a few minutes. The unit is held against the ice box ceiling by two suction cups and the small spring, extending forward and down from the front to contact the inside of the door, acts as a trigger to snap the light on or off as the door is opened or closed.

BE A DETECTIVE. Make secret investigations. Excellent opportunity. Free particulars. Raymond Stultz, Box 633, Elkhart, Indiana.

EDUCATIONAL & INSTRUCTION

MEN Wanted—Learn Tool & Die Making. Automatic Screw Mach. Machinist Trade. Big Demand. Actual Experience. Expert Supervision. Write for Free Book "M". Allied Screw Machine Co., Inc., School Div., 603-9 Lake St., Chicago.

WANTED Immediately, Men-Women, age 18-50, qualify for Government Positions. Commence $105-$175 month. Common education sufficient. Valuable information free. Write, Instruction Service, 234, St. Louis, Mo.

PRACTICAL Arithmetic, Algebra, Geometry, Slide Rule, for shop and office. Simplified Short Cuts. Complete Course $1.00. Slide Rule Free. Mathematics Press, Box 434A, Duluth, Minnesota.

"UNCLE SAM" 1938 Jobs. $105-$175 month. Particulars—list positions—sample coaching free. Write Franklin Institute, Dept. R59, Rochester, N. Y.

ELECTRIC FENCING

MAKE Electric Fencer. It's easy with our simple plans to convert Ford T coil. No further costs. Complete plans 35c. LeJay Mfg., 814 LeJay Bldg., Minneapolis, Minn.

ELECTRIC PENCIL

ELECTRO-SCRIBE: Electric Pencil. Writes—Engraves all Metals. $1.00 postpaid. Details Free. Beyer Mfg. Co., 4515-Y Cottage Grove, Chicago.

EMPLOYMENT SERVICE

EMPLOYMENT Guidance. Booklet. Successful Job Hunting. 25c coin. Employment Counsellors, Box 1283B, Milwaukee, Wisconsin.

JOB-HUNTERS!—Hit-miss methods useless. Valuable check-list ways to get job. 10c. Employment Aids, Box 535, Peekskill, N. Y.

ENGINES, MOTORS, ETC.

WINDING Data, 225 motors, single and three phase. Price $1.00. Motor Data Service, Box 7631, Kansas City, Mo.

EXTERMINATING

COCKROACH, Bedbug Exterminator. 25c makes gallon, which regularly sells for $2.50. Formula 25c. Tom Moore, Chemist, Waterloo, Iowa.

FARMS

40 ACRES, Near White River, unimproved; poultry land. $175, $5 down, $5 monthly. Free list and literature. Hubbard, 224 Grossman Bldg., Kansas City, Kansas.

FEMALE HELP WANTED

WEAR fine hose I send without cost with outfit while taking orders for amazing new hosiery. Replacement guaranteed against holes, snags, and runs. Rush name and hose size. Wilknit, Desk 34-E, Greenfield, Ohio.

FOR INVENTORS

PATENT Your Idea. Write immediately for two free books, "Patent Protection" and "When and How to Sell an Invention." Fully explain many interesting points to inventors and illustrate important mechanical principles. With books we also send "Evidence of Invention" form. Prompt service, reasonable fees, thirty-nine years' experience. Avoid risk of delay. Address: Victor J. Evans & Co., Registered Patent Attorneys, 42-E Victor Building, Washington, D. C.

INVENTOR'S Universal Educator; contains 900 mechanical movements; 50 perpetual motions; instruction on procuring and selling patents and selecting an attorney, etc. Suggests new ideas. Price $1 postpaid in U. S. A. Address Albert E. Dieterich, 511R Colorado Bldg., Washington, D. C.

FREE Booklet (copyrighted) for inventors wishing to sell. Explains marketing facts and buyer locating method that may save costly mistakes and lead to profitable sale of your patented, unpatented invention. For Free copy write: Invention Reporter, E-11236 So. Fairfield, Chicago.

INVENTORS: Send for my free 72-page book. Conscientious, prompt personal service on all patent matters. Registered Patent Attorney, L. F. Randolph, Dept. 341, Washington, D. C.

WE SUCCESSFULLY sell inventions, patented and unpatented. Write for proof, and tell us what you have for sale. Chartered Institute of American Inventors, Dept. 5-B, Washington, D. C.

FORMULAS, PLANS, ETC.

ANALYSIS. Research. Newest guaranteed formulas. Biggest catalog free. Special prices, leads. Gibson Laboratory, Chemists, CE-1142 Sunnyside, Chicago.

SUCCEED With Your Products. Make-Sell Them. Formulas. Processes. Accurate analyses. Catalog free. A. Thaxly Co., Washington, D. C.

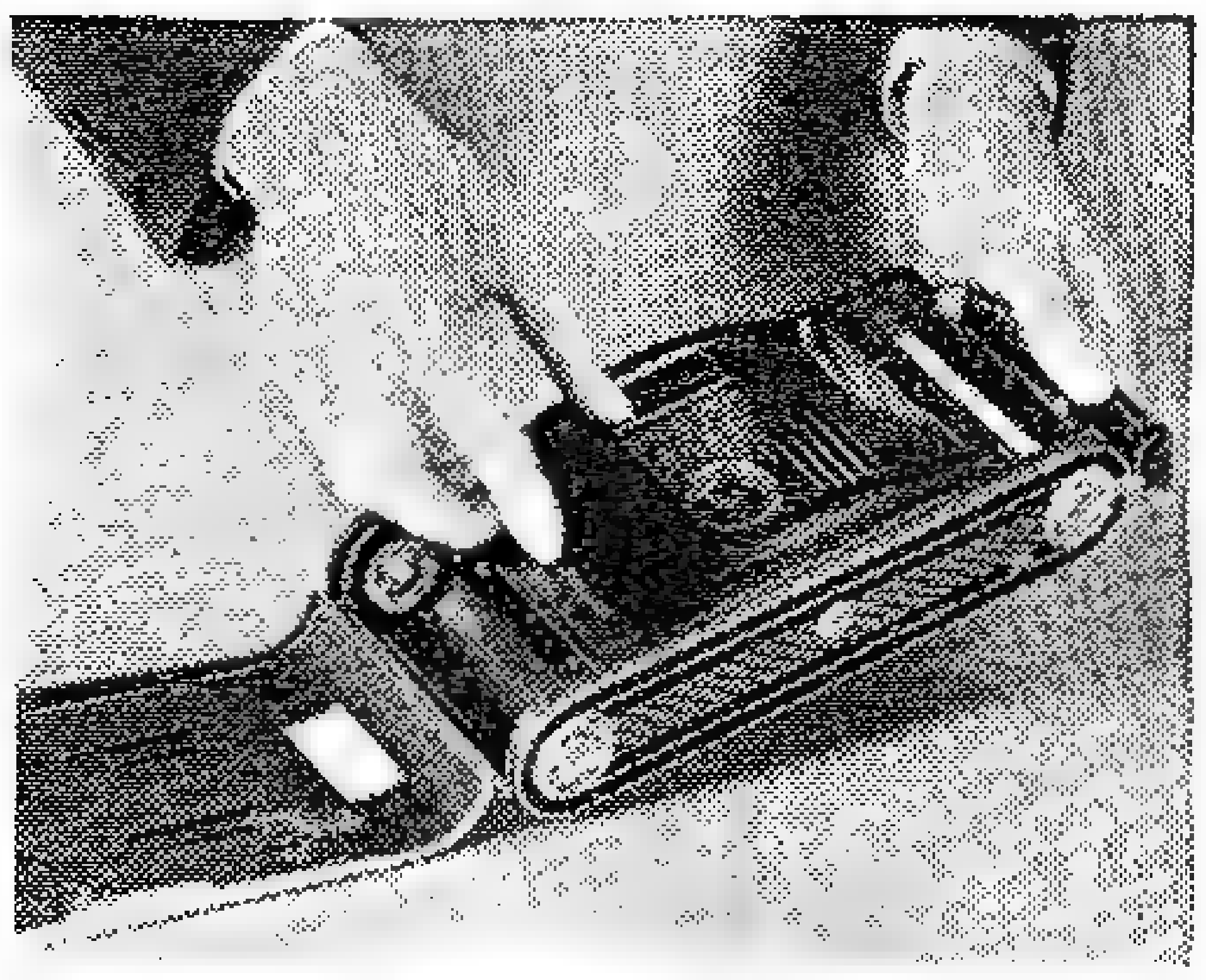
ANY formula 25c. Two hundred assorted one dollar. Guaranteed. Walter, Box 527, Bridgeport, Conn.

PROVEN Money-making Formulas. Free Literature. Broukins, Box 82, Stoneham, Mass.

FORMULAS—Latest Money Makers. Literature free. D-Belfort, 4042 N. Keeler, Chicago.

FORMULAS—All kinds. Guaranteed. Catalog Free. Kemico, 67, Parkridge, Illinois.

Metal Camera Mask Cuts Picture Cost



Designed for use with 3A Kodaks, Series II, a newly developed "twin-exposure" camera back enables owners of such cameras to cut their picture-taking costs almost in half. The new back enables eleven pictures of a 2½x3¼-inch size to be taken on a roll of regular six-exposure film of the size used in the 3A. The back can be installed at any good camera shop in a very short time.

GARDENING

GROW flowers and vegetables without soil. Amazing results in limited space. Any suitable container available. Formula and instructions $1. NU-SOILS, 42A Sun Building, Jackson, Michigan.

HYPNOTISM. Complete 20 Method Course 25c. Western Institute Hypnotism, MM-2984 North Ridgeway, Chicago.

INVENTIONS

PENDING Patents can be made more salable than issued patents. Pay only Government filing fee. Explanatory booklet free. American Patents Corporation, Dept. 5-E, Washington, D. C.

INVENTIONS—Patented, Unpatented. Bought outright, royalty. Write Arellano-Power Company, 1 North La Salle St., Chicago, Illinois.

INVENTORS: Write for free copy "Pointers on Promoting Inventions." National Service Bureau, Dept. M, St. Louis, Mo.

INVENTIONS WANTED

SMALL inventions wanted by manufacturers. I'll help you sell your invention. Write for free circular. S. Hull, 7829-L Euclid Avenue, Cleveland, Ohio.

INVENTIONS quickly commercialized. Unpatented protection guaranteed. Pacific Inventors Agency, 2236 Post, San Francisco, Calif.

INVENTIONS Commercialized. Patented or unpatented. Write Adam Fisher Co., 582 Enright, St. Louis, Mo.

INVENTORS

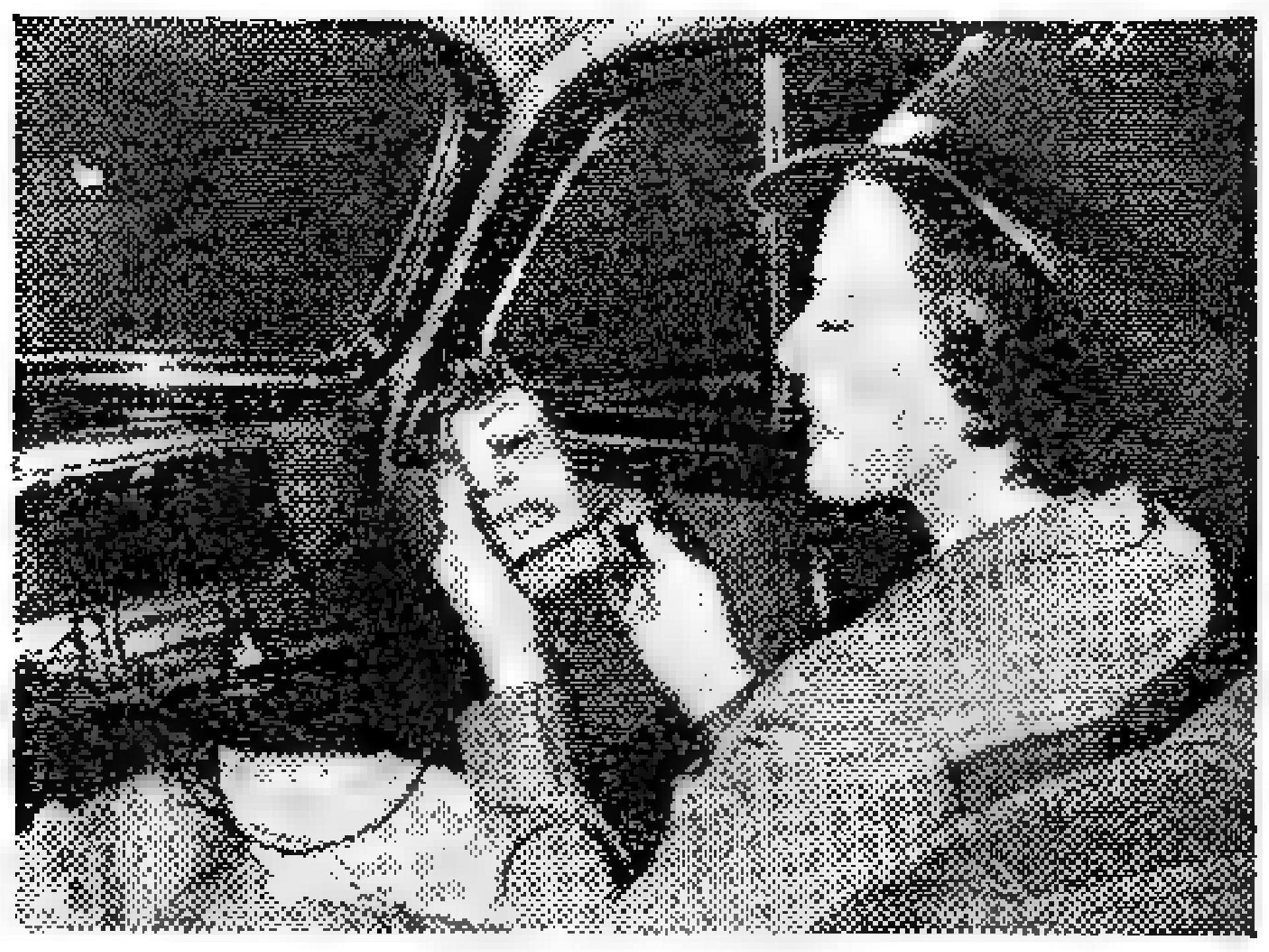
CASH for Unpatented or Patented inventions or ideas. Stamp for particulars. Mr. Ball, 9441-F Pleasant, Chicago.

GET Your Own Patents. Legal blanks, complete instructions $1. Cudding Sons, Campbell, California.

MACHINERY, TOOLS & SUPPLIES

MOTOR Speed Reducer ratio 144 to 1, rating up to ¼ h. p. with friction clutch for overload- protection—$3.95. Send for free catalog: Compressors, Paint Sprayers. National Electric Tool Co., 560 Washington, Chicago.

Auto Vanity Mirror Has Built-In Light



Shaped to fit the hand, a newly developed vanity mirror for feminine motorists features a built-in lamp which floods the user's face with a beam of soft light. The lamp is connected by an extension cord to an electrical outlet on the auto and is controlled by a tiny switch.

MICROMETER: $1.50 postpaid. Accurate measurements by thousandths, 0-½ inch with instructions. Also one inch size with adjustable anvil. $2.65 postpaid. W-Box 3432 Merchandise Mart, Chicago.

MAGIC TRICKS & NOVELTIES

FREE! Magic Catalog 500 Tricks. Amaze, Mystify friends. Write today! Lyle Douglas, Station A-3, Dallas, Texas.

WE SUPPLY every noted magician. Large Professional catalog 25c. Holden, 222 West 42nd St., New York.

MALE HELP WANTED

STEADY Work—Good Pay—Reliable man wanted to call on farmers. No experience or capital required. Pleasant work. Home every night. Make up to $12 a day. Wonderful new proposition. Particulars Free. Write McNess Co., Dept. 136. Freeport. Illinois.

WANTED—Men to represent large shoe company. Good pay every day. No experience needed. Complete sales outfit sent free. Write Consolidated Shoe System, Dept. S27, Chippewa Falls, Wisconsin.

MALE & FEMALE HELP WANTED

M. M. EARNED $267, three weeks, raising mushrooms in cellar! Exceptional, but your cellar, shed perhaps suitable. We buy crops. Book free. United, 3848 Lincoln Ave., Dept. 89, Chicago.

MIDGET AUTOMOBILES

BUILD a Midget Miller Racer. Complete plans for constructing this authentic midget automobile appear in the new 1938 edition of How-To-Build-It along with many other interesting home and workshop plans. Send 50c for this 148-page book to Modern Mechanix Publ. Co., Greenwich, Conn.

MIDGETS! Motors! Parts! Used. new; sport, racing. Over 20 midgets. 80 motors, $4.00 up. Latest Lists. 20c. Shipps Midgets, Box 543-B, Zanesville. Ohio.

MISCELLANEOUS

MARK your Tools with a Steel Hand Stamp. Any Three Initials 75 Cents. Gideon A. Pike, North Attleboro, Mass.

BURIED TREASURE, Minerals, free booklet, photographs. Fisher, Palmer Bldg., Hollywood.

AUTHENTIC information, any subject, 50c. Paramount Press Service, Atlanta, Mo.

MODEL ENGINES

LOCOMOTIVES Electric, Steam, Gas Engines. Castings, supplies. 25c. Latest Catalogue, usual refund. EMCO., 2417 North Ashland, Chicago.

MODEL RAILROADING

MODEL Railroad Supplies "O" Gauge (¼" scale—1¼" between rails) Freight Car Body Kits $1.00, Illustrated Catalog 10c. Westbrook Co., Hasbrouck Heights, New Jersey.

MODELS & MODEL SUPPLIES

YOUR Ideas developed into practical working model. 30 years successful experience; thousands satisfied customers. Confidential service guaranteed. Bank references. Send 3c postage for 32 page book "Making Inventions Pay." Crescent Tool Company, Dept. T. Cincinnati, Ohio.

ENGINE Catalog 20c. Particulars free. Evraymesco, 28 N. Clinton, Chicago.

MONEY MAKING OPPORTUNITIES

"SPARETIME Roads To Riches," explains hundreds new easy moneymaking opportunities, 10c. Lewis Co., 828-F Carpenter, Oak Park, Illinois.

HOMEWORK Opportunities Magazine—10c. Sample—5c. Schumacher, 3503 Hirsch, Chicago.

SEMIYEARLY forty pages 10c. 6x9. Home Industries. (D89) Benson, Nebr.

MOTION PICTURE & SOUND EQUIPMENT

LEARN Motion Picture Theatre Business. Home-Study Training: Management, Advertising, Projection. Free Catalog. Give Age. Theatre Institute, 345 Washington, Elmira, N. Y.

MOTORCYCLES & SUPPLIES

RECONDITIONED Motorcycles. New—used parts for all makes. Authorized Harley-Davidson Dealer. Whitman Motorcycle & Supply Co., 405-9 Southwest Blvd., Kansas City, Mo.

SEND 10c for 1936 Handbook of Information listing new and used parts, for Indian, Harley, Excelsior, Henderson; accessories, tires, batteries. Indian, 622 East Grand, Des Moines, Iowa.

SEND 15c for illustrated used Motorcycle catalog. Bargains. Largest stock genuine Indian parts and motorcycles. Indian Motorcycle Sales, Kansas City, Mo.

OFFICE EQUIPMENT

TYPEWRITERS, multigraphs, addressing machines, adders, dictaphones, duplicators. sealers, folders. Save half. write Pruitt, 553 Pruitt Bldg., Chicago.

OLD MONEY WANTED

COMMEMORATIVE Half Dollars, Lincoln, Stone Mountain, Oregon, Texas, Cleveland, Kentucky, San Diego, Long Island, $1.50 each. Illustrated Catalogue No. 14, 25c. Norman Shultz, Salt Lake, Utah.

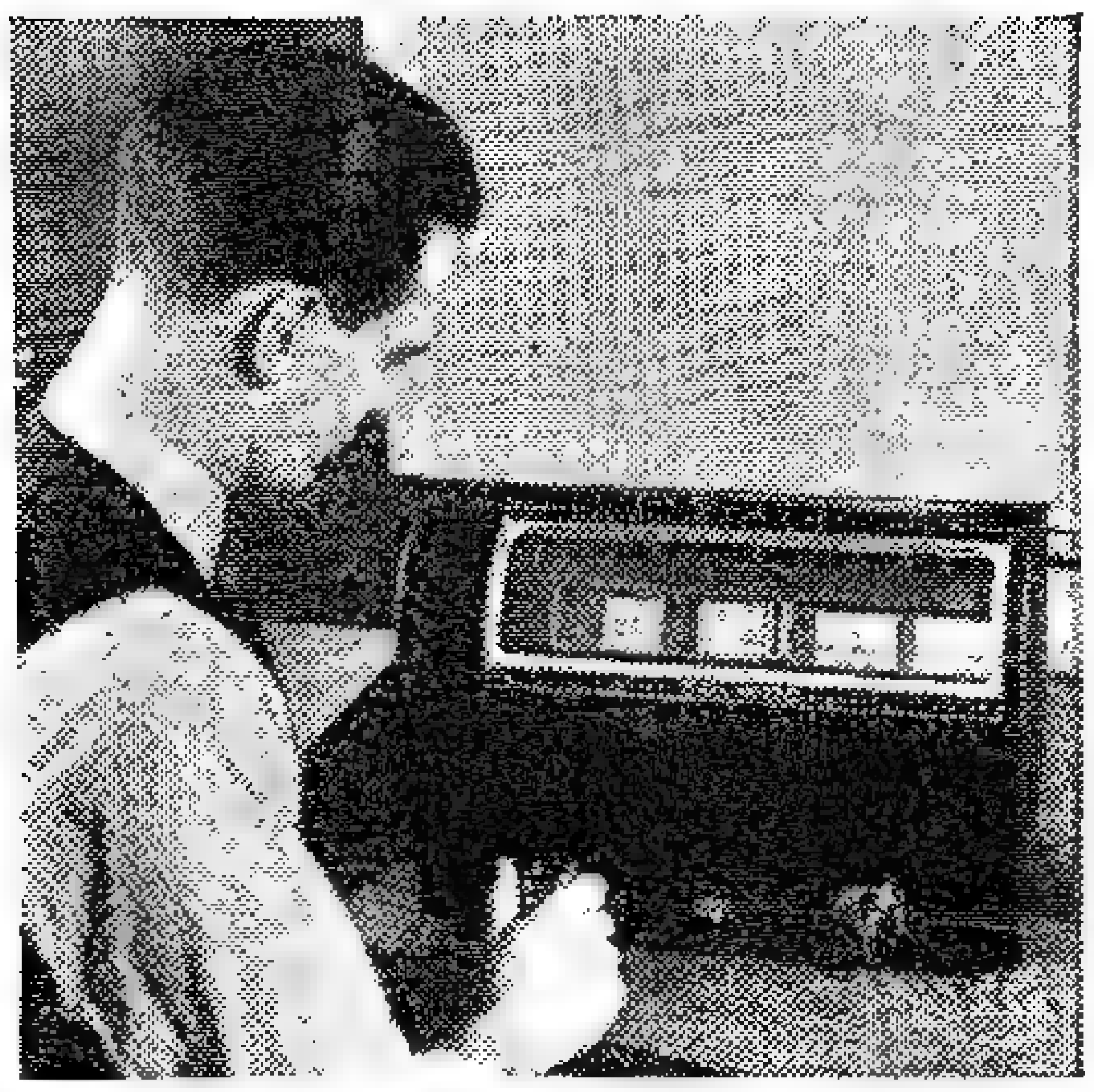
OUTBOARD MOTORS

ELECTRIC outboard from old automobile generator. Operates with car battery. Smooth—quick. Easy to build plans 10c. LeJay Manufacturing, 514 LeJay Building, Minneapolis, Minn.

PATENT ATTORNEYS

PATENT Your Idea. Write immediately for two free books, "Patent Protection" and "When and How to Sell an Invention." Fully explain many interesting points to inventors and illustrate important mechanical principles. With books we also send "Evidence of Invention" form. Prompt service, reasonable fees, thirty-nine years' experience. Avoid risk of delay. Address: Victor J. Evans & Co., Registered Patent Attorneys, 41-E Victor Building, Washington, D. C.

Scale Shows Postage Needed for Package



A newly developed parcel post scale (above) can be used to weigh any package up to 70 pounds in weight. In addition, the scale has a calibrated aluminum chart fitted into it in such a manner that as the weight of the package is recorded, the correct figures for postage required to mail the package to various zones is shown.

PATENTS—Before too heavy an outlay of time or money is made on an invention, a search of the Patent Office records should be made to determine as nearly as possible whether or not the same idea has been patented before. The cost of this search is small, while the value of the facts it uncovers is often considerable. We offer inventors and manufacturers a thorough, prompt, confidential search service—plus experienced counsel and assistance in every phase of Patent and Trade-Mark practice. Write for our new free book containing valuable information relating to patent procedure. Clarence A. O'Brien and Hyman Berman, Registered Patent Attorneys, 28-Y Adams Bldg., Washington, D. C.

"INVENTOR'S Guidebook" containing 96 mechanical movements and advice about patenting, selling inventions, also "Record of Invention", Free. Frank A. Ledermann, Patent Attorney-Engineer, 154 Nassau Street, New York.

FINER Finishing. Rolls developed and printed, with One Colored enlargement, or two professional enlargements. All for 25c (coin). Genuine, Nationally Known, Moentone Superior Quality. Moen Photo Service, La Crosse, Wis.

UNPATENTED Ideas can be sold. I tell you how and help you make the sale. Particulars, with list of manufacturers and wanted inventions, sent free on request. Write Wilson Holmes, 905 Barrister Bldg., Washington, D. C.

HAVE YOU a sound, practical invention for sale, patented or unpatented? If so, write Chartered Institute of American Inventors, Dept. 5-A, Washington, D. C.

PATENTS. Booklet free. Highest references. Best results. Reasonable fees. Watson E. Coleman, Victor Building, Washington, D. C.

PATENTS

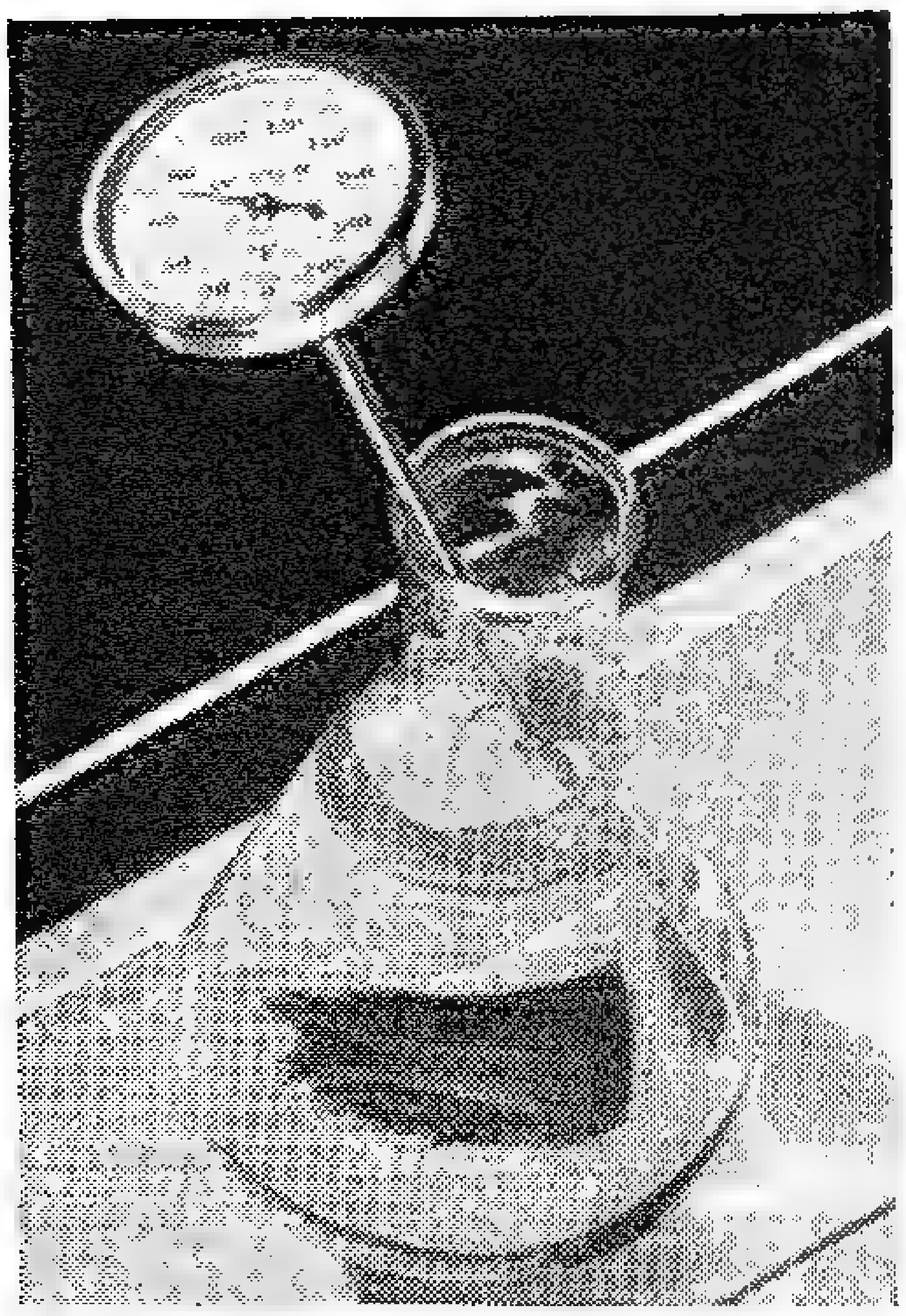
INVENTIONS Commercialized. Patented or unpatented. Write Adam Fisher Co., 582 Enright, St. Louis, Mo.

PERSONAL

STUTTERING and Stammering corrected at home. Booklet free. Paul J. Wolfe, Box 52, Pittsburgh, Penna.

STAMMERING, Stuttering, for relief write E. H. Tarbox, 109 Penna. Ave., Binghamton, N. Y.

Thermometer Boasts Dial-Type Scale



A new type of laboratory thermometer, provided with a dial-and-pointer scale encased in stainless steel and mounted atop an eight-inch stainless steel stem, has been developed by a well known manufacturer in Newark, N. J. The unit is said to be the first dial-type thermometer with an all-metal temperature element sufficiently accurate for scientific use, accuracy of ½ of 1% over the entire scale being guaranteed by the manufacturer.

PHOTO DEVELOPING

DEVELOP and print your own pictures. Save time, money with our complete outfit, $1.95 plus postage, or sent C.O.D. Includes electric ruby lamp, printing frame, photo paper, chemicals and equipment. One of hundreds of amazing bargains in our free, newest, money-saving bargain book. Send for it today! Central Camera Co., 230 So. Wabash, Dept. 15-T, Chicago.

ROLLS DEVELOPED—25c coin. Two 5x7 Double Weight Professional Enlargements, 8 gloss prints. Club Photo Service, LaCrosse, Wis.

AMAZINGLY Beautiful, Roll Developed, 8 Natural Color Prints, 25c. Reprints, 3c. Natural Color Photo, D-39, Janesville, Wis.

SENSATIONAL Offer. Five 5x7 enlargements 25c. Cardinal Photo, Summit, N. J.

PRINTING, GUMMED LABELS

PRINT your own cards, stationery, circulars, advertising. Save money. Easy rules furnished. Print for others, big profits. Junior outfit, $9.00; job presses, $11 up. Details free. Kelsey Presses, B-57, Meriden, Conn.

125 LETTERHEADS 8½x11 and 125 Envelopes—$1.00 postpaid. Benneville, 907 West Roosevelt, Philadelphia.

500 Letterheads and 500 Envelopes, $3.25 cash. Barry, Babylon, New York.

1,000 1x2 GUMMED Labels, 4 lines, 50c. Paramount Press, Atlanta, Mo.

PROPELLERS

PROPELLERS Sled-Airplane, Lowest Prices, Catalog 10c. Woodcraft Propellers, Hillside Station, Wichita, Kans.

RADIO & TELEGRAPHY

RADIO BUILDERS' MANUAL—A book of radio set building plans and kinks for the home experimenter. Everything from a crystal set to a powerful 6-tube auto radio is included. Price 50 cents—order directly from Modern Mechanix Publishing Co., Fawcett Bldg., Greenwich, Conn.

RADIO Engineering, broadcasting, aviation and police radio, Servicing, Marine and Morse Telegraphy taught thoroughly. All expenses low. Catalog free. Dodge's Institute, King St., Valparaiso, Ind.

RADIOS

PLANS 18 Distance Crystal Sets—SW record 4,250 miles, with "Radiobuilder" year—25c. Laboratories, 7700-K East 14th, Oakland, Calif.

"SHORT Wave" Crystal Set! Illustrated plans 10c. Unicraft, 4932 N. Eighth, Philadelphia.

RAZOR BLADES

100 FINEST Quality, blue steel razor blades. Single edge $1.25. Double edge $1.00. Ashton Mdse. Mart, 63 Basswood, Lawrence, Mass.

SALESMEN WANTED

MEN Wanted for Rawleigh Routes of 800 families. Sales way up this year. Reliable hustler should start earning $30 weekly and increase rapidly. Write today. Rawleigh's, Dept. E-S-MOM, Freeport, Ill.

BIG commissions selling stores celluloid pricing tickets, metal shelf moulding, menu covers, signs, chrome changeable letters. T. Pricing Press, 124 White St., New York.

FULL size, visible total Adding Machine, only $9.95. Unlimited market. Big commissions. Addomatic, Dept. B-13, 430 N. Oakley, Chicago, Illinois.

ATLAS Window Sign letters. Large Sizes, Penny Each. Beautiful Free Samples. Atlas, 7941-G Halsted, Chicago.

SPECTROSCOPES

SOLAR Spectroscope $1. Chemical and ore spectroscope $2.50. Spectrometer $5. Cudding Sons, Campbell, California.

TELESCOPES, MICROSCOPES, ETC.

EXPERIMENTERS—Assortment 18 unmounted lenses. Suitable—telescopes, microscopes, etc. $1.00 postpaid. Optical Works, Milton, Pa.

TELESCOPES, Microscopes, Binoculars; 1938 bargain catalog free. Brownscope Company, 5 West 27th Street, New York.

TELESCOPES, Microscopes, Binoculars. Lowest Prices. Free Catalog. The Hobby Man, Jefferson, Iowa.

TELESCOPES, Microscopes, Binoculars, Mineralogy, Chemistry. Catalog free. Teeko, Evanston, Illinois.

BUILD Reflecting telescopes; catalog free. Instructions 10c. Optical Laboratories, Larchmont, N. Y.

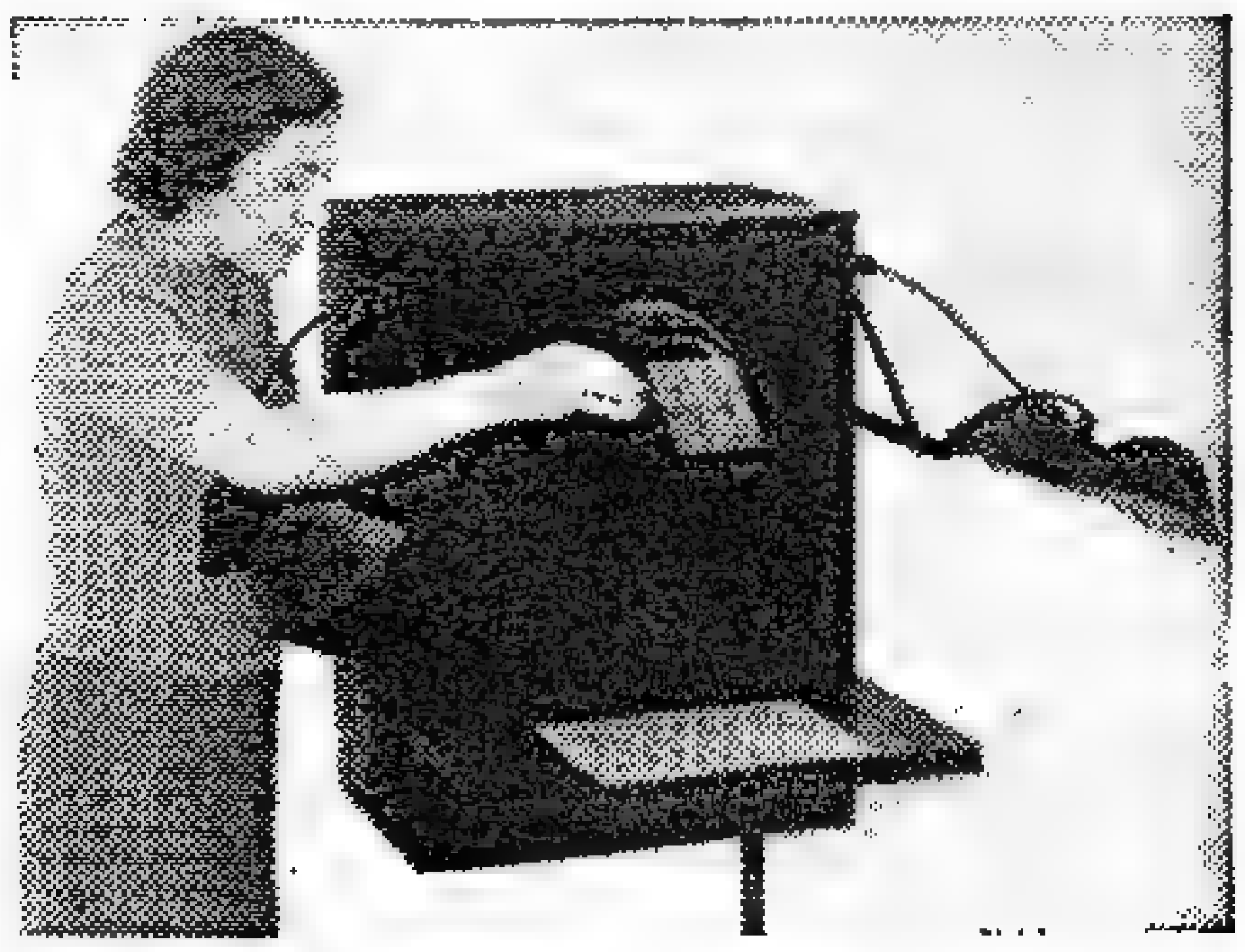
BUILD astronomical telescope. Lens kit with mirror and instructions, $1.98. Chas. Koch, DeBeque, Colo.

FREE Instructions. Build Powerful Telescope. Low Cost. Atemsco, Box 213M, Flushing, N. Y.

VENTRILOQUISM

LEARN Ventriloquism by mail; small cost, 3c stamp brings particulars. Geo. W. Smith, 125 North Jefferson, Room S694, Peoria, Ill.

Portable Photographic Machine Operates in Ordinary Light



A newly developed portable photo-copying machine with a fixed focus makes facsimile copies, similar to photostats, of letters and records and can be operated in ordinary office light.

VIOLET RAY LAMP

ULTRA Violet-Infra Red. Dual Ray Health Lamp. Two separate units in one. Promotes Sun Tan—Vitamin "D." Automatic control. AC-DC current, $3.90 postpaid. Details Free. Beyer Mfg. Co., 4515-M Cottage Grove, Chicago.

WELDING

HOME-MADE Arc-welder from North-East (Dodge) 12 volt automobile generators. Requires field coil and brush changes for 40 volts D.C. Remote Control 25-125 amperes, Dual 25-200. New method designed for beginners, actual welding views, real facts, over 3,000 instructive words. Certified Plans $1.00, C.O.D. $1.12, Airmail 12c extra. Welders Club of America, BB-3432 M-Mart, Chicago. Special: Limited quantity, Dodge 12 volt used generators with Certified Plans $5.00 F.O.B. Chicago. Special: Send ad with above orders for extra plans, "How to build Dodge Arc-Welder without rewinding."

ATTENTION! $1.06 brings big laboratory tested collection of over 100 of the most practical conversion plans. Arc-welders from electric auto motors, light-plants, battery-chargers, Dodge generators, D.C. Power motors and generators. Fifty car generator conversions make wind light plants, wind chargers, A.C. and D.C. generators, motors. Old transformers make A.C. Arc-welders, spot-welders. Many others. All in one book. Practical Methods, Box 165, St. Paul, Minn.

ARC-WELDING Outfit $1.25. Weld fenders, braze, solder. Lavrow, 4368-W, Warren, Detroit. Stamp appreciated.

WIND ELECTRIC PLANTS

BUILD wind light plant. We show you how. Complete plans and valuable catalog 10c. Wind plant parts, welders, electric fences. LeJay Mfg., 614 LeJay Bldg., Minneapolis, Minn.

FREE Electricity from Wind. Build your own Windcharger. Cost 98c for material plus used car generator. Drawings—Instructions 10c. Wesco, Minneapolis, Minn.

WIND DRIVEN PLANTS

GENERATOR propellers, expertly designed, factory prices. Universal Aircraft, Fort Worth, Texas.

Cut Sections For Microscope

[*Continued from page* 135]

begun to harden and set around the edges of the well, insert the bud and orient so that it lies either straight across or straight up and down. It may be necessary to hold it in place with warmed forceps until the paraffin has hardened sufficiently to prevent any change in position. When completely cold and hardened, the paraffin mass is ready to cut.

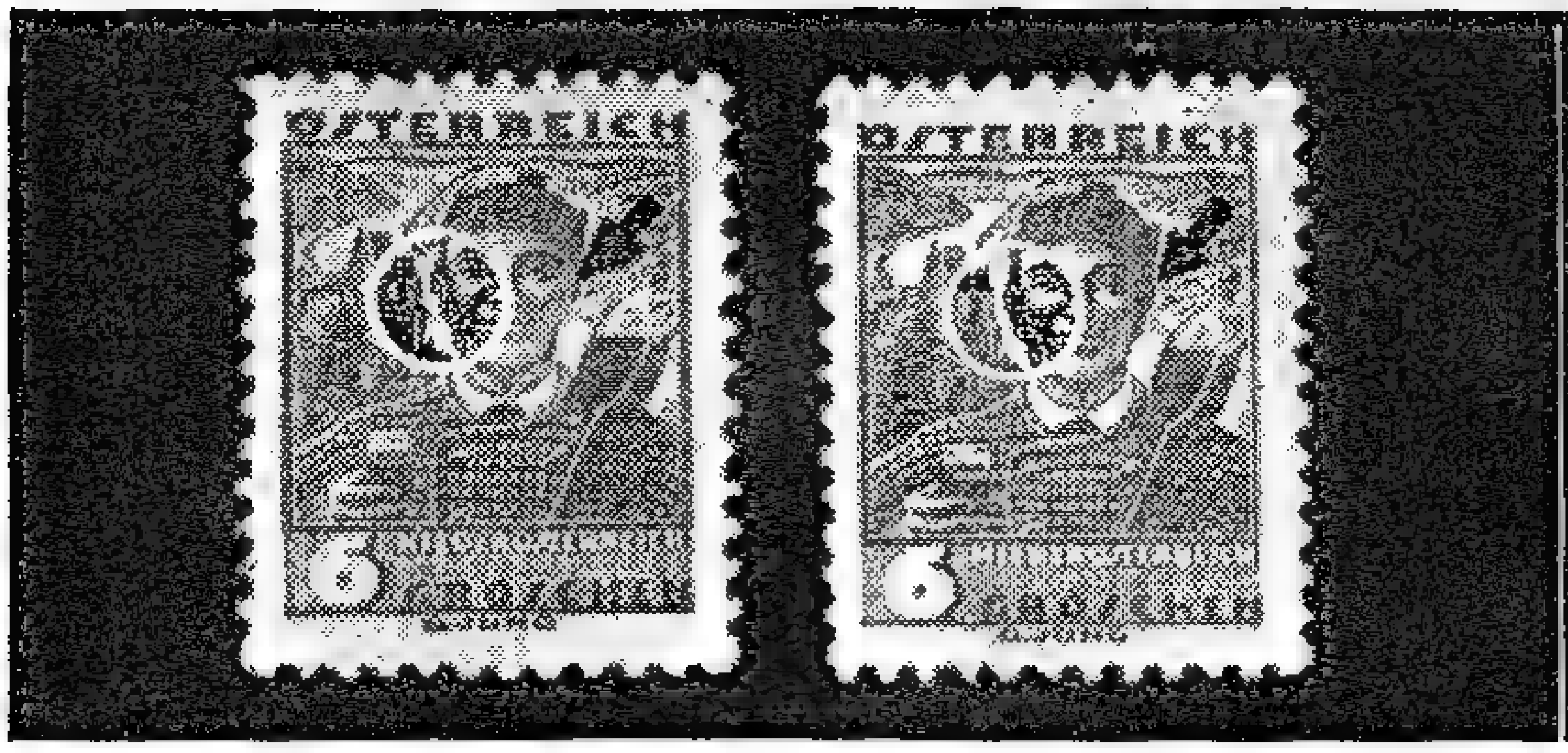
This brings up for consideration the last but an important point—the plane of section. Organic structures are built around certain planes of symmetry and the microscopist should know the terms employed. The higher animals, such as a cat or fish or man show bilateral symmetry or two-sided relationship of parts, the left half of the body being a mirror image of the right. One plane passes lengthwise through the body from head to tail and bisects the back and belly surfaces; a section in this plane is termed *sagittal.* Another passes lengthwise at right angles to the sagittal, bisecting the right and left sides; this is a *horizontal* or *frontal* section. A third is at right angles to both of these, passing across the body, and such a cut is a *transverse* or *cross* section. The first two are both *longisections,* as opposed to the third.

In objects not bilateral, but built with the parts radiating from a common center, as in a starfish or a tree trunk, the symmetry is radial and the planes receive different names. A *radial* section is any longitudinal one that forms a radius, while a *tangential* cut is longitudinal and parallel with a radial, but forms a tangent and not a radius of the circle, lying off-center. The third plane is transverse or cross, as before.

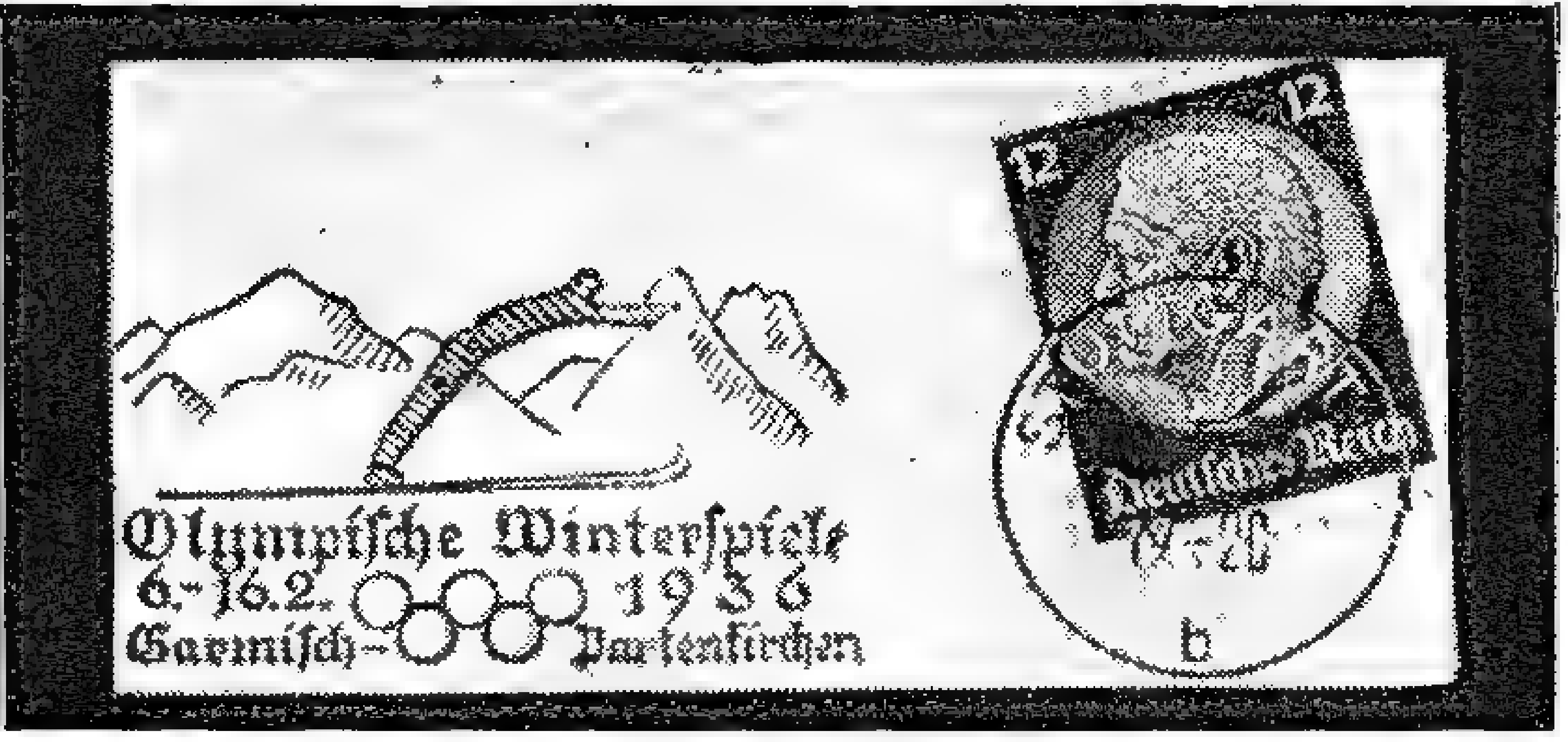
In none of these cases do the planes pass obliquely, and the operator must use care never to make oblique sections, but only those parallel to one of the planes of symmetry. Oblique sections are confusing and do not give a picture of internal organization that can be interpreted easily. The best practice is to gain a knowledge of

[*Continued on next page*]

ADDING INTEREST TO STAMP COLLECTING



When the Austrian government issued the stamp shown on the left they never expected it to be sought by collectors everywhere. When issued it was found that the ears were reversed on the man. The corrected stamp appears at right.



In order to properly advertise the Winter Olympics at Garmisch-Partenkirchen, the German government supplied the post office at Stuttgart with a special postmark depicting a skier and the Five Ring Olympic symbol as shown above.

ADLETS FOR HOBBYISTS

(See regular classified section for rates and other information.)

STAMPS

SUPER-WONDER Packet offered, containing 60 different stamps from Afghanistan, Transjordania, North Borneo, Manchukuo, Sudan, Guadeloupe. Iraq, Sarawak, French and British Colonies, including natives, beasts, ships, etc. This entire packet for only 5c to approval applicants. Big illustrated lists free. Kent Stamp Company, Box 87-Z (G.P.O.), Brooklyn, N. Y.

1897 GRAND Comore Islands, rare old genuine Baden, Turks Caicos, $5 U. S., British Colony Map Stamp, Western Samoa, etc. Everything 3c with approvals. Viking, 1-MM Hanson Place, Brooklyn, N. Y.

FANTASTIC Indochina, Somalicoast German State, Perak, Selangor, Sembilan, Bicolored Banana Airmail, Siberia—Free with Approvals! Postage 3c. Saxon Company, 3 Dekalb Ave., Brooklyn, N. Y.

DIAMOND Airpost Commemorative Issue Complete, Proletariat Portraits Complete, Dragon Stamp, with 117 additional, cataloging $3.00, only 10c. Friendly Filatelists, Box 4428M, Philadelphia, Penna.

NEW Rivera nude stamp! World's largest triangle! Congo, Sudan, South Seas, bicolors, pictorials and many others. Only 3c with approvals. Cactus Junior Approvals, Box 1870-D, Tucson, Arizona.

STAMPS! 100 diff. 3c; 500 diff. 35c; 1,000 diff. 90c! Illustrated Album (4000 spaces) 22c. Approvals sent. Tatham Stamp Co. (D9) Springfield, Mass.

BRITISH Colonies. 54 Different including Jubilees and Coronations 10c with approvals. Swedell, 3129 Garfield Ave., Minneapolis, Minn.

UNITED STATES—45 Different, Perforation Gauge, Hinges, Bargain Price List—all for 10c. Seidenberg, Baroda, Mich.

MIDGET MIXTURE—100 foreign stamps—Asia, Malta, Europe, etc., 5c. Guy Elsea, Bowling Green, Ohio.

FREE!!! Two Coronation Sets. Postage 3c. Roberts, 312T Shearerbldg, Baycity, Michigan.

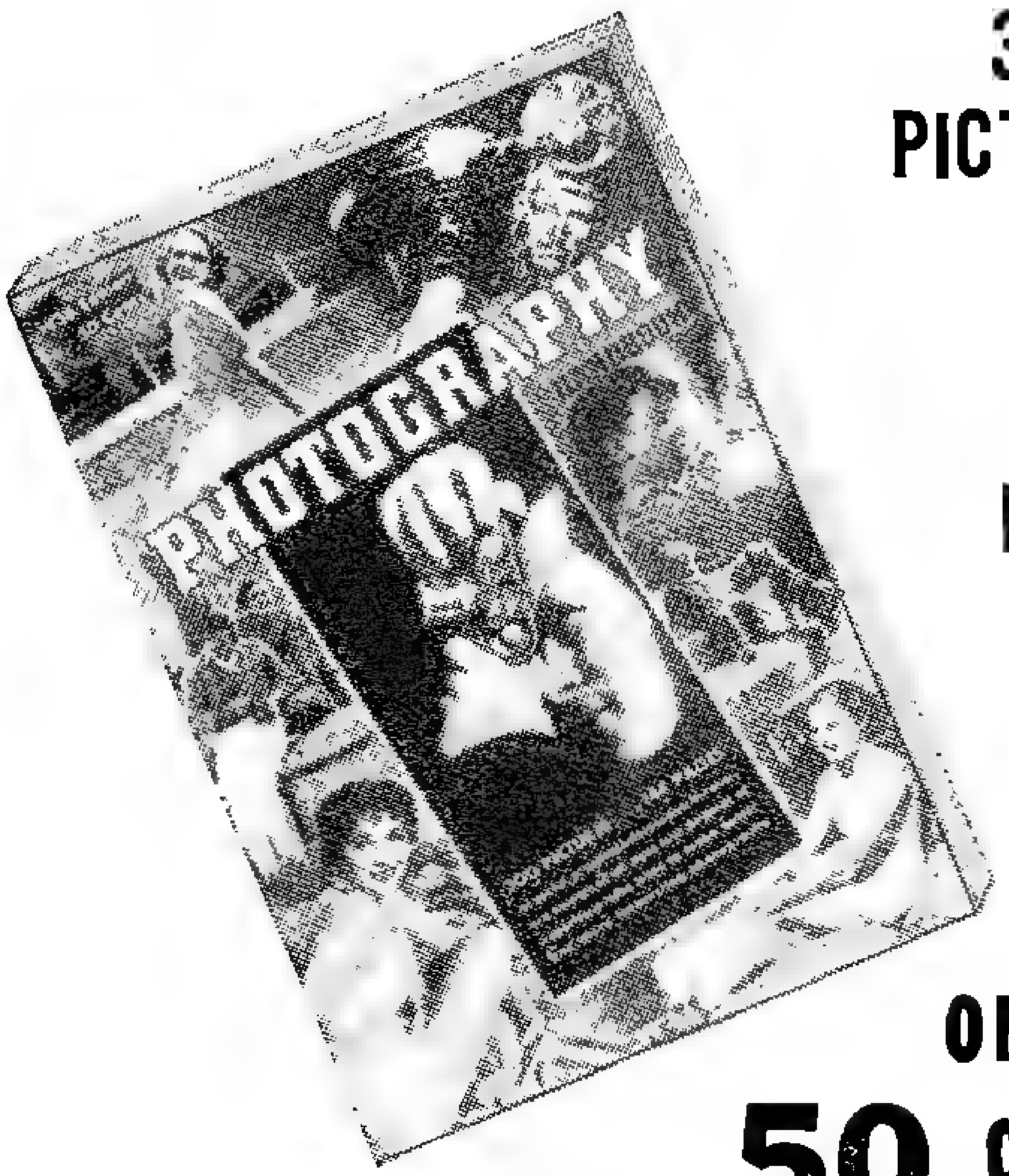
COINS

FREE: Foreign Coin, Banknote and Large Illustrated coin catalogue, for 4c postage. Approvals sent. Tatham Coinco, Springfield-9, Mass.

INDIAN CURIOS

INDIAN CURIOS. 100 good ancient Arrowheads $3.00. Tomahawk Head 50c. Illustrated catalog 5c. H. Daniel, Hot Springs, Arkansas.

CAMERA FANS—
YOU ASKED FOR
THIS BOOK!



300
PICTURES

144
PAGES

ONLY
50 CENTS

For months readers of MODERN MECHANIX have been asking us: "Why don't you put out a complete photo manual of some kind that tells in non-technical language how to develop, print and enlarge our films, how to make our own darkroom equipment, how to improve our cameras, how to make good pictures?" The new PHOTOGRAPHY HANDBOOK is *that* book! Although it has been on sale only a few weeks, it has already been acclaimed far and wide as one of the most *useful* and *practical* books on the market. No matter what kind of a camera you own—$1.00 box brownie or a $200 miniature—you will want a copy right away.

On sale at newsstands, or obtainable directly from us, postpaid. Fill out the coupon below:

FAWCETT PUBLICATIONS, INC.,
Fawcett Building, Greenwich, Conn.

Enclosed find fifty cents. Please rush my copy of the new PHOTOGRAPHY HANDBOOK.

Name ....

Address ....

(Remit by money order or check. Do not send coins through the mails.)

A Utility Table For The Auto

[*Continued from page* 128]

On the same end of the post but on the opposite face is screwed the long tab of a T hinge and the two sections of the table are now ready for assembling. To do this, hook the table top into the dash compartment and place the supporting post under it, moving it toward the rear of the car until it just misses hitting the front edge of the seat. Make sure the post is square and true with the table and mark the hinge holes for the screws.

Now take the table out of the car and screw the leg to the under side of the top, being careful that the leg folds away from you when the table is in use. To attach the table, elevate the front edge, push the back edge into the compartment, hook the two brass clips in the lip of the dash, pull toward you and lower the table to writing position. The leg will automatically swing into its proper place.

As may be noticed in the detail drawing of the method of hooking the table to the dash, once the table is in position, the brass clips prevent it from sliding forward or tipping up at the rear, while the ½″ square wood strip prevents the table from sliding too far into the compartment. Thus the table is firmly held at that point.

The table may be left in position while you get in and out of the seat. Just lift up on the table slightly, to free the leg of weight, push the leg forward, slide your own leg by the table and return the table support to a vertical position. It is thus not necessary to disturb a typewriter or anything else that may be on the table if one must get in or out of the car.

Cut Sections For Microscope

[*Continued from page* 141]

structure by inspecting first a cross and then a longitudinal section, and most microscopists make both and mount one of each under the same cover glass.

In the case of tree buds this would be a recommended procedure. Cut true cross sections near the middle, then cut true radial sections and mount one of the best of each on a single slide, side-by-side. Never mix unrelated subjects on the same slide, however.

Next month we are going to delve into the mysteries of preparing such materials as plant and animal sections for permanent preservation, but meanwhile, so that you can see what some of your efforts look like under the microscope, stain a few of your best sections in dilute mercurochrome, place in strong alcohol for overnight, then into xyol or carbol-xylol for an hour and mount in balsam. These are not the perfectly finished slides we have promised you, but are merely to serve until the next step in technique can be explained. And here's wishing you good cutting!

Coal Shows Heat Content

A new experimental method by which scientists can look at a piece of coal and tell how much heat it will generate was announced at the meeting of the American Institute of Mining and Metallurgical Engineers.

Two midwestern geologists, L. C. McCabe of the Illinois Geological Survey, and Prof. T. T. Quirke of the University of Illinois, described the secrets of coal analysis in their technical paper, "Angle of Polarization as an Index of Coal Rank."

Tiny cubes of coal are polished and brightly illuminated with a small lamp. The light reflected from the polished surface becomes polarized and is studied with Nicol prisms to determine the angle of polarization. By a fundamental rule of optics known as Brewster's Law, the angle of polarization of the reflected light can be related to what scientists call the index refraction. This last is the degree of bending which a material will cause as light passes through it.

Final and significant step in the research was the discovery that the amount of heat in B. T. U. (British Thermal Units) which a unit amount of coal can produce is related by a simple straight-line relationship with its index of refraction as measured in the apparatus.

Using the wide range of different kinds of coal found in Illinois from woody lignite to soft bituminous and so on to harder bituminous it was found that as the heating qualities of the coals increased, so too, did their index of refraction.

The method, pointed out Mr. McCabe and Prof. Quirke, is still in the experimental stage and the accuracy of the technique could be increased ten or one hundred times with better equipment.

"This investigation," they declared, however, "with improvised equipment imperfect in many particulars, has discovered what appears to be a physical criterion for rank identification (of coal)."

Desert Produces Gas For Ice

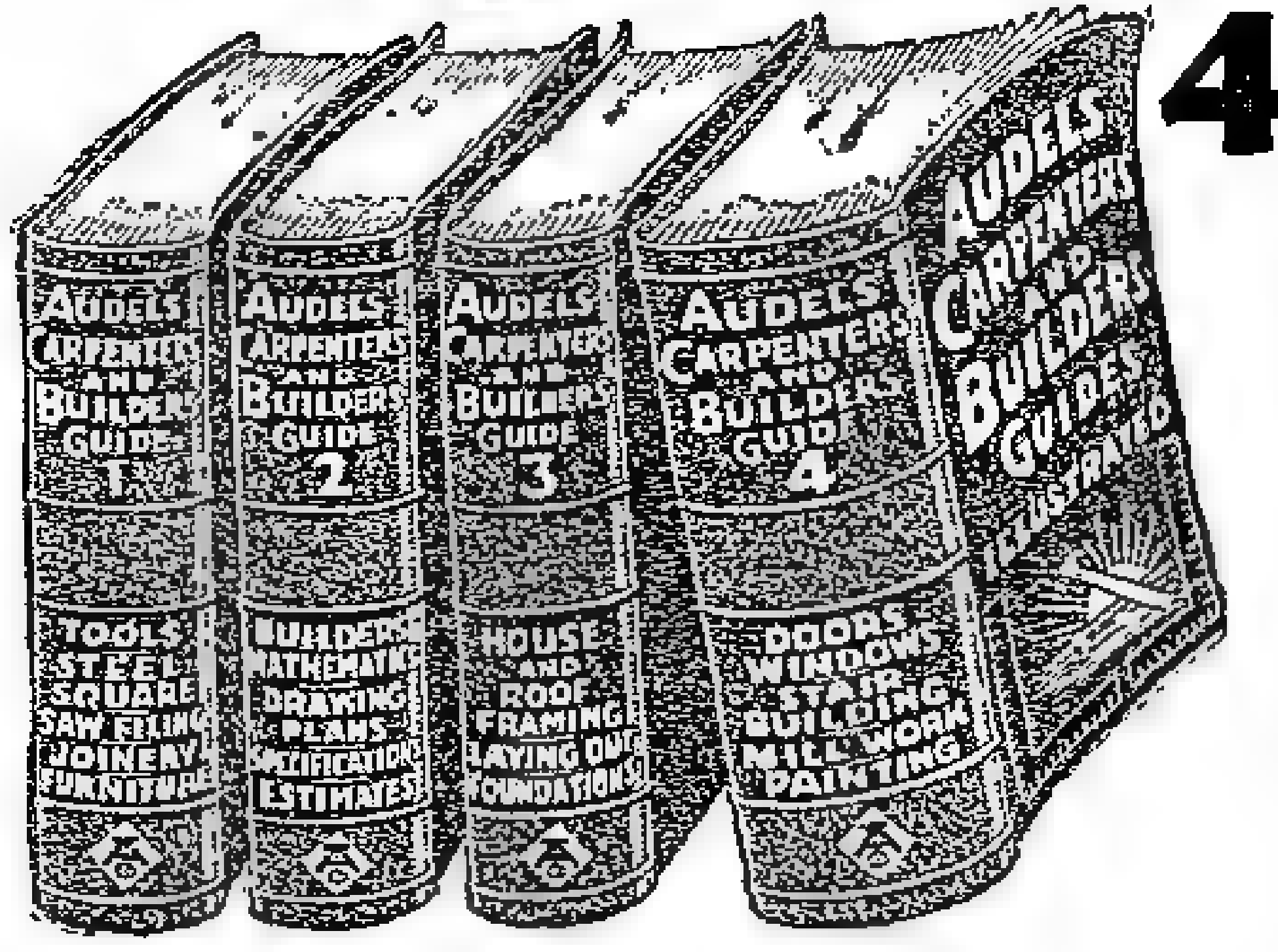
MINED like petroleum in shallow wells, carbon dioxide gas is being converted into dry ice at two plants near the shore of the Salton Sea in the Imperial Valley of Southern California.

The carbon dioxide was discovered several years ago when a power company drilled for dry steam. Later two engineers, W. P. Morse and Carl W. Einhart, investigated the possibilities of converting the gas into ice at low cost. Today 12 tons of the refrigerant are being produced daily.

Wells 650 feet deep tap gas, which then is pumped four and a half miles to a compressing plant. After temperature is reduced it is fed in the form of snow, into giant presses.

AUDELS Carpenters and Builders Guides

4 vols. $6


AUDELS CARPENTERS AND BUILDERS GUIDE 1
TOOLS STEEL SQUARE SAW FILING JOINERY FURNITURE
AUDELS CARPENTERS AND BUILDERS GUIDE 2
BUILDERS MATHEMATICS DRAWING PLANS SPECIFICATIONS ESTIMATES
AUDELS CARPENTERS AND BUILDERS GUIDE 3
HOUSE AND ROOF FRAMING LAYING OUT FOUNDATIONS
AUDELS CARPENTERS AND BUILDERS GUIDE 4
DOORS WINDOWS STAIR BUILDING MILL WORK PAINTING
AUDELS CARPENTERS AND BUILDERS GUIDES

Inside Trade Information for Carpenters, Builders, Joiners, Building Mechanics and all Woodworkers. These Guides give you the short-cut instructions that you want—including new methods, ideas, solutions, plans, systems and money saving suggestions. An easy progressive course for the apprentice and student. A practical daily helper and Quick Reference for the master worker. Carpenters everywhere are using these Guides as a Helping Hand to Easier Work, Better Work and Better Pay. To get this assistance for yourself, simply fill in and mail the FREE COUPON below.

Inside Trade Information On:

How to use the steel square—How to file and set saws—How to build furniture—How to use a mitre box—How to use the chalk line—How to use rules and scales—How to make joints—Carpenters arithmetic—Solving mensuration problems—Estimating strength of timbers—How to set girders and sills—How to frame houses and roofs—How to estimate costs—How to build houses, barns, garages, bungalows, etc.—How to read and draw plans—Drawing up specifications—How to excavate—How to use settings 12, 13 and 17 on the steel square—How to build hoists and scaffolds—skylights—How to build stairs—How to put on interior trim—How to hang doors—How to lath—lay floors—How to paint

THEO. AUDEL & CO., 49 W. 23rd St., New York City

Mail Audels Carpenters and Builders Guides, 4 vols., on 7 days' free trial. If O.K. I will remit $1 in 7 days, and $1 monthly until $6 is paid. Otherwise I will return them. No obligation unless I am satisfied.

Name...

Address...

Occupation...

Reference...M. M.

New Catalog of

TRAILER PARTS

New catalog of trailer parts at bargain prices. Axles, straight, $4. Drop center axle, $7.50. Drop center axle undercarriage, $19.50, complete less tires. Cable-controlled brakes on axle, $15 extra. Electric brakes—prices on request. Send for FREE Catalog today.

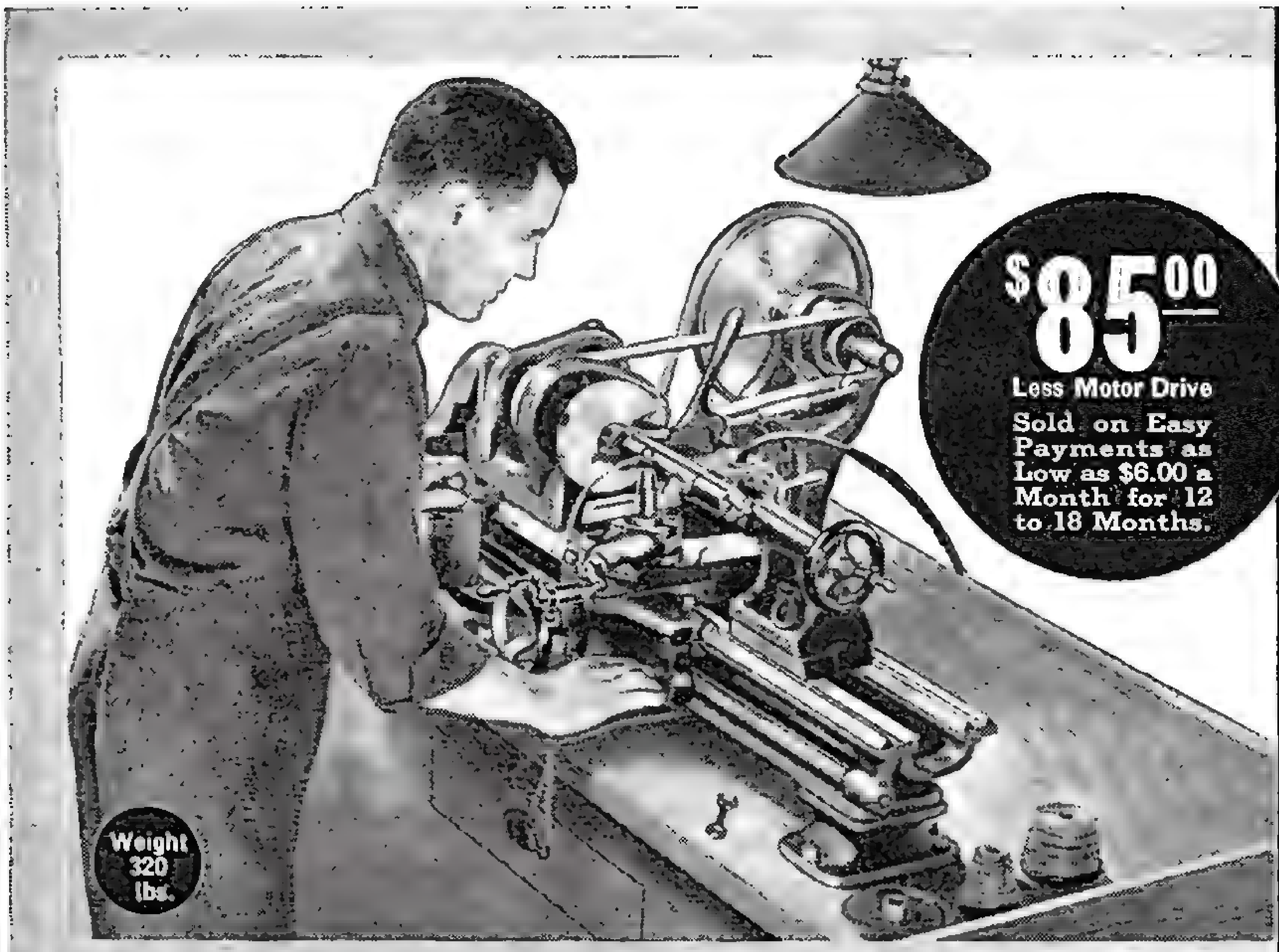
Shamrock Trailer Parts, 12319 Turner, Detroit, Mich

PATENTS

More than 62 years' successful experience securing good Patents for inventors. Write for FREE booklets explaining Patent procedure, selling inventions, etc.

C.A.SNOW&CO.

Dept. C Snow Building
WASHINGTON, D. C.



$85.00

Less Motor Drive

Sold on Easy Payments as Low as $6.00 a Month for 12 to 18 Months.

No. 415-YA, 9¼″ swing by 3′ bed Workshop Bench Lathe with Horizontal Motor Driven Adjustable Countershaft, ¼ h.p. Reversing Motor, Switch and Belts. *($15 Down—$6 Monthly for 18 Months)* **$117.00**

SOUTH BEND BACK-GEARED SCREW-CUTTING PRECISION LATHE

●

This 9-inch South Bend Lathe used by:

MANUFACTURERS
TOOL ROOMS
LABORATORIES
MACHINE SHOPS
—Automotive
—Electrical
—Gun Smiths
U. S. GOVERNMENT
SCHOOLS
HOME WORK SHOPS
INVENTORS

●

The 9″ x 3′ South Bend Precision Lathe does these operations:

TURNS—BORES—CUTS SCREW THREADS—FACES—DOES MILLING, CHUCKING, REAMING, DRILLING, FILING AND HUNDREDS OF OPERATIONS IN STEEL, IRON AND OTHER METALS.

●

There are 5 sizes of South Bend Lathes—9″, 11″, 13″, 15″ and 16″ swing with bed lengths 3′ to 12′. In motor or countershaft drives. Priced $85 to $1500.

INVALUABLE TO INDUSTRIES EVERYWHERE FOR HANDLING PRECISION OPERATIONS . . .

WELL-KNOWN industries everywhere are using the 9-inch Workshop South Bend Lathe—and finding it the most profitable investment they can make. Designed and constructed for precision accuracy, this 9-inch Lathe handles machining operations to the most exacting specifications. Workmanship and new features insure speed, accuracy, and versatility. Industry finds it cannot afford to overlook this remarkable tool.

Features include—Twin Gear Reverse to Lead Screw, Ball Thrust Bearing on Spindle, Automatic Longitudinal Screw Feed to Carriage, Precision Lead Screw for cutting screw threads from 4 to 112 per inch, ¾-inch hole through spindle taking collets up to ½-inch, V-ways on lathe bed. 38 attachments are available for milling, grinding, draw-in collet chuck work, taper work, and many other operations. Made in 3′, 3½′, 4′, and 4½′ bed lengths. Costs less than 2 cents per hour operating from ordinary lamp socket.

SOUTH BEND LATHE WORKS

267 East Madison St., South Bend, Indiana, U.S.A.

LATHES ARE STOCKED IN PRINCIPAL CITIES

Chicago, Ill.—C. B. Burns Mchry. Co., 541 W. Wash. Blvd.
New York, N. Y.—A. C. Colby Mchry. Co., 183 Centre St.
Philadelphia, Pa.—W. B. Rapp Mchry., 132 No. Third St.
Los Angeles, Cal.—Eccles & Davies Mchry., 1910 Santa Fe St.
Detroit, Michigan—Lee Mchry. Co., 6318 E. Jefferson Ave.
Milwaukee, Wisconsin—Voell Mchry. Co., 1533 No. 16th St.
Boston, Mass.—The MacKenzie Mchry. Co., 36 Oliver St.
Cleveland, Ohio—Reynolds Mchry. Co., 2034 E. 22nd St.

WRITE FOR THESE BOOKS

☐ No. 33LB, "How to Run a Lathe," 25c,
☐ No. 36A, "How to Cut Screw Threads," 10c,
☐ No. 35, "How to Grind Cutter Bits," 10c,
☐ No. 46, "9-inch Workshop Catalog," Free.

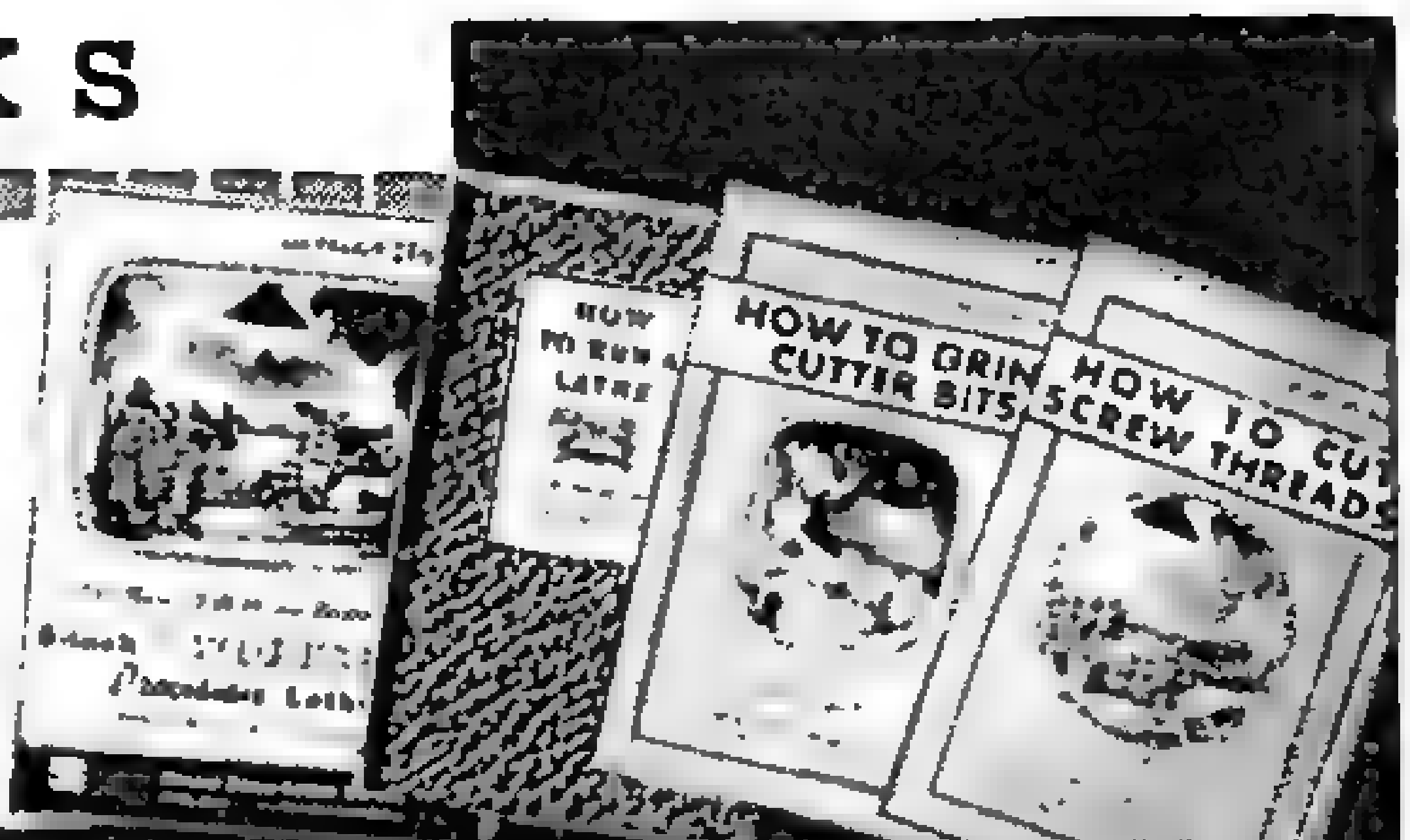
SOUTH BEND LATHE WORKS,
267 E. Madison St. South Bend, Ind., U.S.A.
Please send the books checked here.

Class of Work....................................

Name....................................

Address....................................

City....................State....................



SOUTH BEND *Precision* LATHES

Cotton Used As Roadbinder

Down in Alabama recently dusky cotton pickers, pulling long cotton sacks bulging with the fleecy staple, paused long enough at the end of their rows to watch highway construction nearby. Their attention was attracted by the laying of a canvas-like material between the layers of sand, slag, and asphalt.

The Negro farm hands didn't know it, but the same substance they were picking, except in different form, was being used to build up the road. No one took the trouble to tell them, but they were seeing history in the making. Now traffic is moving over this first "cotton highway," a small part of an extended program being fostered by the U. S. Department of Agriculture in which some 6,167,000 square yards of cotton fabric are being provided for the building of over 500 miles of roads in 24 states.

Advocates of "cotton paving" contend that it not only reinforces the bituminous surfacing of the highway, but also prevents it from cracking and improves its resistance to water. In a broader sense it is hoped that a great new domestic market will be provided for the chief product of the southern farm.

But the cotton fabric must prove its case before being widely used in highway construction. Six bales of cotton per mile are required for the usual "farm to market" highway and its use increases construction costs about $1,000 per mile. A year or more will be required for an adequate test of the new highway.

The rolls of cotton fabric as they come from the mill are 82 inches wide, three rolls being required after allowing for lapping to cover 20 feet of the usual 22-foot roadway. It is laid on a coating of hot tar, then more tar applied, with other layers of slag and asphalt coming on top.

Alabama proposes to build 119 miles of cotton fabric highways, using 1,260,094 square yards of the material, or more than any other state. North Carolina comes next with plans for 105 miles. Twenty-two other states will use varying amounts.

Naval Observatory Builds More Time-Signal Clocks

Two automatic crystal-controlled clocks are being built by the U. S. Naval Observatory in Washington, D. C., for addition to its time-signal broadcasting service, Capt. J. F. Hellweg, Superintendent of the Observatory, reports in his synopsis of work for the fiscal year 1937.

Used to send out at frequent intervals time signals for mariners and scientists who find them indispensable, the clocks, which are regulated by a vibrating crystal, are intended for the naval stations at Mare Island, Calif., and Honolulu. Twenty time signals are sent each day from the naval radio station at Arlington, Va., and five are broadcast from Mare Island.

Be a RADIO EXPERT

Learn at Home to Make

$30, $50, $75 a WEEK

Do you want to make more money? Broadcasting stations employ engineers, operators, station managers and pay up to $5,000 a year. Spare time Radio set servicing pays as much as $200 to $500 a year—full time servicing jobs pay as much as $30, $50, $75 a week. Many Radio Experts operate their own full or part time Radio businesses. Radio manufacturers and jobbers employ testers, inspectors, foremen, engineers, servicemen, paying up to $6,000 a year. Radio operators on ships get good pay and see the world. Automobile, police, aviation, commercial Radio, and loud speaker systems offer many good opportunities. Television promises many good jobs soon. Men I trained have good jobs in Radio.

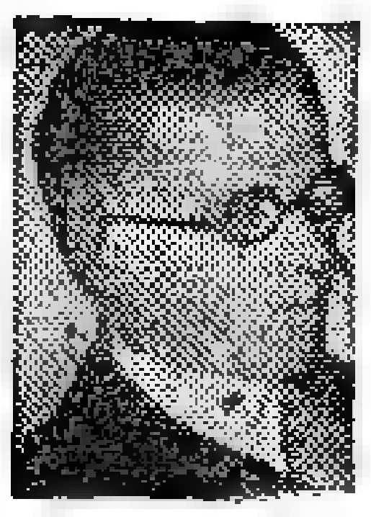
Many Make $5, $10, $15 a Week Extra in Spare Time While Learning

The day you enroll I start sending you Extra Money Job Sheets. They show you how to do Radio repair jobs, how to cash in quickly. Throughout your training I send plans and ideas that made good spare time money for hundreds of fellows. I send special Radio equipment which gives you practical experience—shows how to conduct experiments, build circuits illustrating important Radio principles.

Find Out What Radio Offers

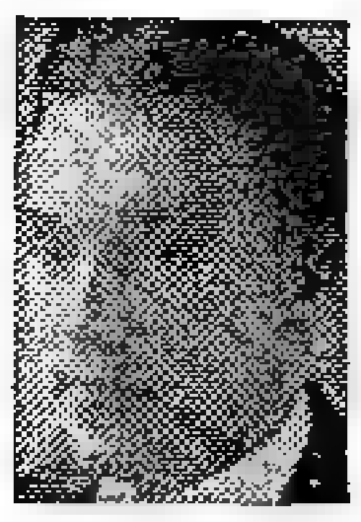
Mail coupon for "Rich Rewards in Radio." It's free to any fellow over 16 years old. It points out Radio's spare and full time opportunities, also those coming in Television; tells about my Training in Radio and Television; shows you letters from men I trained, telling what they are doing, earning; shows my Money Back Agreement. MAIL COUPON NOW in an envelope or paste on penny postcard.

J. E. SMITH, President
Dept. 8EH
National Radio Institute
Washington, D. C.



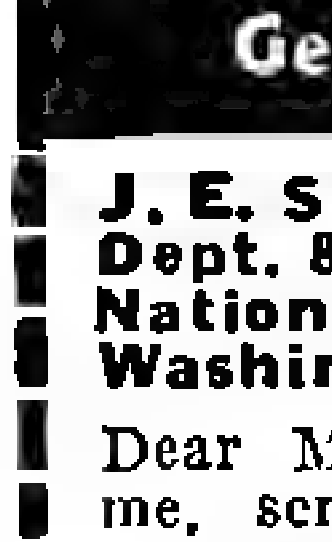
Chief Operator Broadcasting Station

"When I completed 20 lessons, I obtained my Radio Broadcast Operator's license and immediately joined Station WMPC, where I am now Chief Operator."—HOLLIS F. HAYES, 85 Madison St., Lapeer, Mich.



Own Business Pays $300 a Month

"I now have my own Radio business which shows three hundred dollars a month profit—thanks again to National Radio." — FRANK T. REESE, 39 N. Felton St., Philadelphia, Penna.



Earned $50 First Month in Spare Time

"I knew nothing about Radio. After four lessons, I began servicing Radios, earning $50 the first month. Last winter I made as high as $100 a month in spare time."—G. F. WALTON, 808 West Olney Road, Norfolk, Va.

Mail this Now
Get 64-page Book FREE

RICH REWARDS IN RADIO

J. E. SMITH, President,
Dept. 8EH,
National Radio Institute,
Washington, D. C.

Dear Mr. Smith: Without obligating me, send "Rich Rewards in Radio," which points out the spare time and full time opportunities in Radio and explains your 50-50 method of training men at home in spare time to become Radio Experts. (Please Write Plainly.)

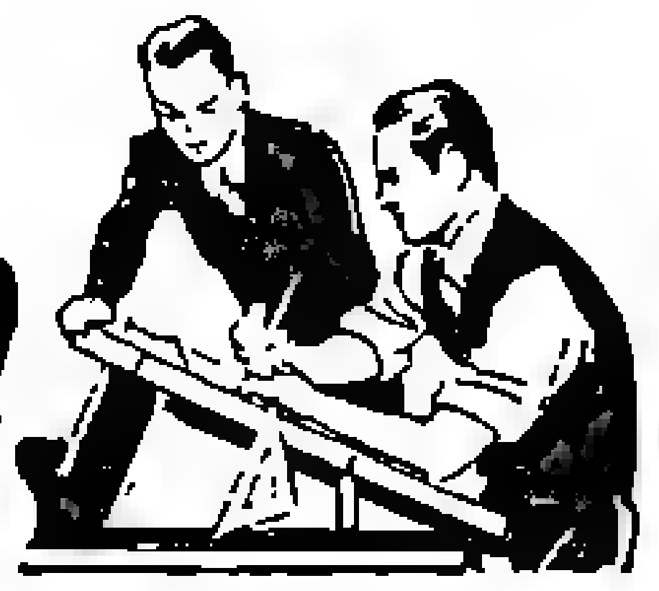
AGE........

NAME ....

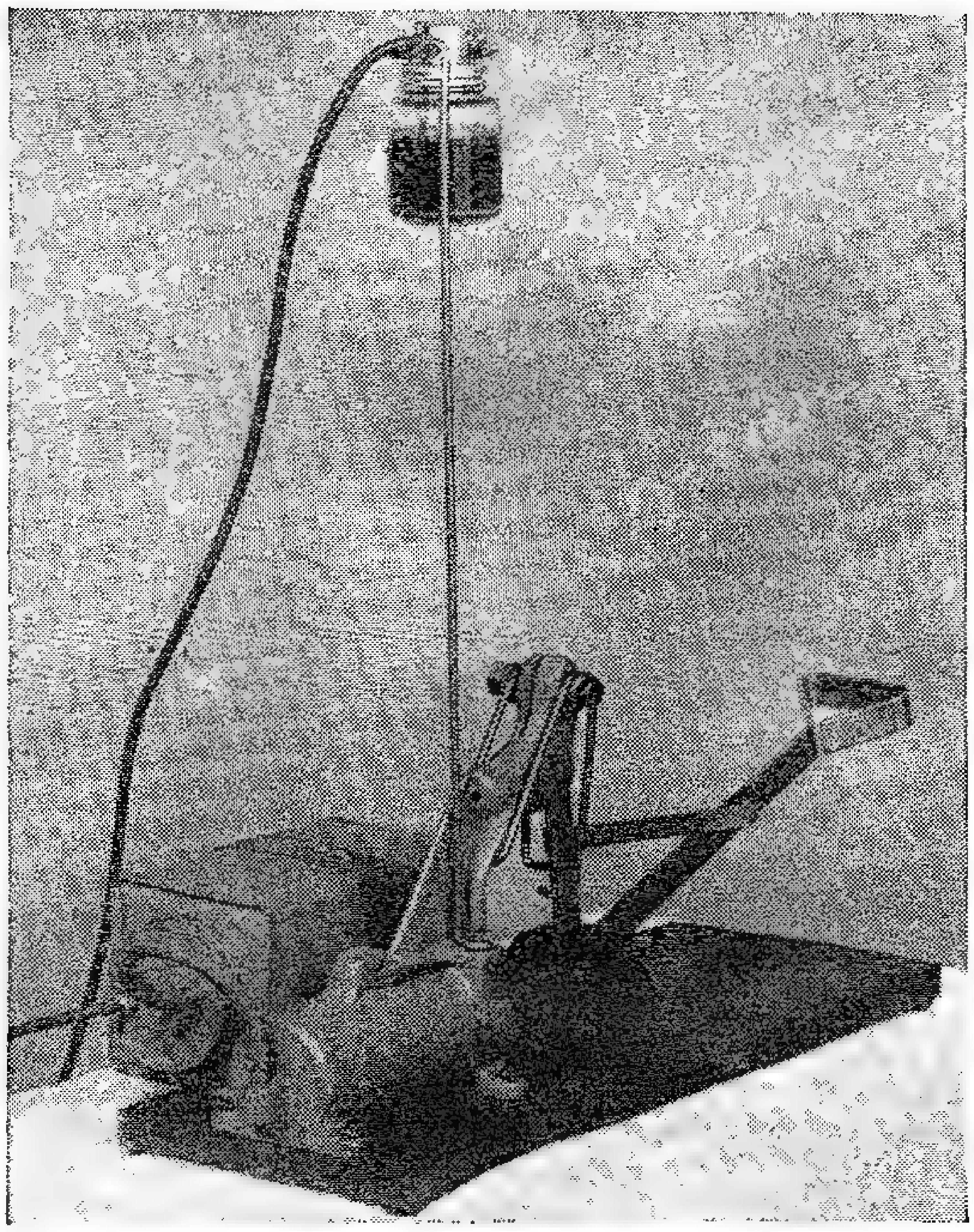
ADDRESS ....

CITY.............................. STATE............

New Ideas for Home & Shop



Names and addresses of manufacturers of products described below will be sent free to any reader on request.

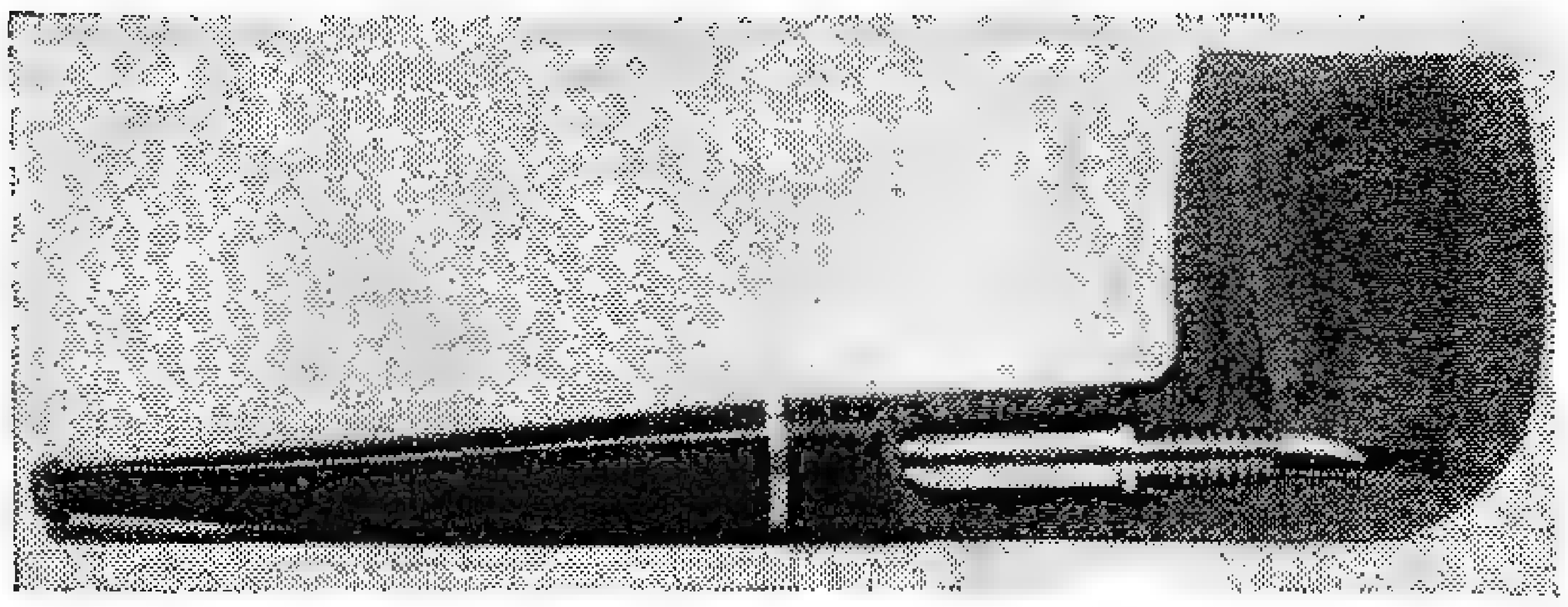


Compressed air for operation of a paint sprayer is created by this foot operated pump. The air is stored in a small tank and released through a regulator valve at a constant pressure.

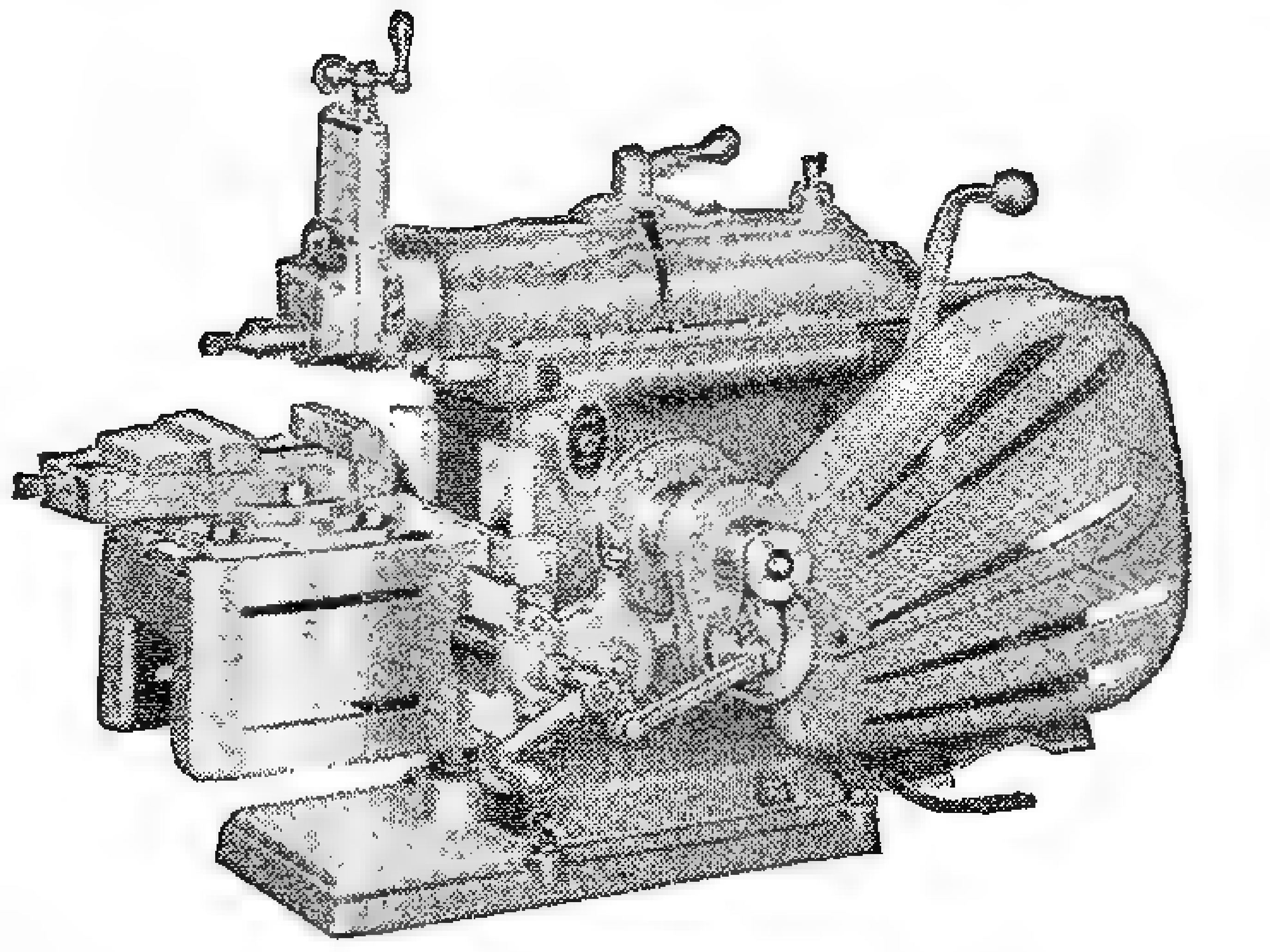
A wrist watch that not only keeps time but supplies the user with a stop watch, a tachometer and a telemeter.

A handy drawing instrument for ruling lines and lettering.

An electric flare designed to provide a powererful red beam from any angle. Even though knocked over in the road, because its lens has no dark zone, it can be seen easily. It will give either a steady or intermittent glare. It is water and dust proof.



A pipe using a dehydration tube to eliminate excessive condensation. Without the use of an absorbant cartridge, 97 per cent of moisture is eliminated, keeping shank clean and dry.



A seven-inch shaper incorporating principles of modern shaper construction. Four speeds, between forty-five and 200 strokes a minute are available.

A rubber or friction tape holder to be worn on the belt. It allows the tape to be rolled off as needed.

A special light for use when a car is on a lift and workmen are under it. Attached directly to the lift, it rides up or down as the car is raised or lowered. Reflector and bulb can be removed without disturbing the wiring.

A pressure oiler for delivering the exact amount of oil to the spot where it is required. The amount of oil delivered on each stroke is regulated by an adjusting nut.

A basket type of sink strainer. It can be opened or closed quickly and easily, and it can be emptied without the fingers touching the refuse. Two sizes are available for large and small sink openings.

A one-piece asbestos suit for fire fighters. The shoes and the body of the garment are in one piece and it is put on with a zipper fastener. The zipper is protected by an asbestos flap, so that in the event the wearer is overcome, the suit can be removed quickly.

A reversible hand guard which can be used with or without gloves. It is seven and a half inches long, and is made of high quality chrome leather, steel stitched to prevent ripping.

A reversible ratchet handle for $3/8$ inch square drive sockets and attachments.

"Three's company when it's me.. my pipe.. and VELVET"

Velvet
PIPE AND CIGARETTE TOBACCO
LIGGETT & MYERS TOBACCO CO.

—the **MILDNESS**
of fine old
Kentucky Burley
aged in wood

—the **FLAVOR**
of pure maple
sugar for extra
good taste

Velvet packs easy in a pipe
Rolls smooth in a cigarette
Draws right in both

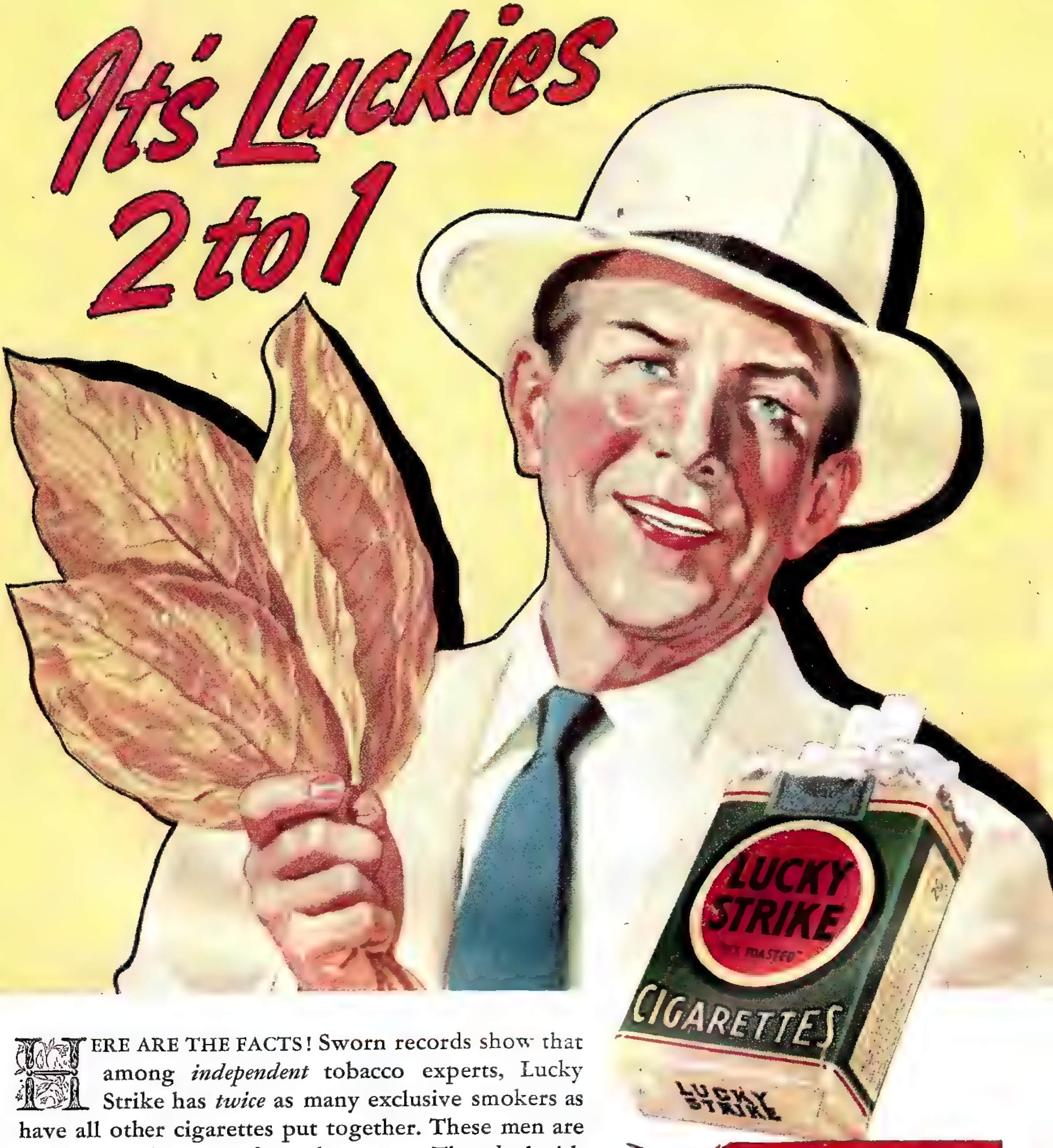
Better smoking tobacco

Copyright 1938, Liggett & Myers Tobacco Co.

PRINTED IN U.S.A.

With Independent Tobacco Experts..

WITH MEN WHO KNOW TOBACCO BEST



HERE ARE THE FACTS! Sworn records show that among *independent* tobacco experts, Lucky Strike has *twice* as many exclusive smokers as have all other cigarettes put together. These men are auctioneers, buyers and warehousemen. They deal with all, but are not connected with any manufacturer. They *know* tobacco and they smoke Luckies . . . 2 to 1!

Remember, too, the throat protection of the exclusive process, "It's Toasted." This process removes certain harsh irritants present in all tobacco, and makes Lucky Strike a light smoke—easy on your throat.

Have You Heard the Chant of the Tobacco Auctioneer

Copyright 1938, The American Tobacco Company

Alt. Cover

"U.S. NEEDS PLANES AND MEN"—GENERAL ARNOLD

MAY

MODERN MECHANIX

NOW 15¢

SEE PAGE 72

Special Photography Section
See Page 103

Double Page Spreads

A frank man to man talk about PATENTS-INVENTIONS -SELLING INVENTIONS

THE world of invention moves on. About a hundred years ago people were saying, "There's nothing left to invent"—today we know that is one of the funniest things ever said. Just think what has happened in the last hundred years! Autos, radios, airplanes, and thousands of useful, practical devices for home, shop and office have been invented and put on the market. Inventors are constantly making the world a better place to live in. Did you see a notice in the paper that an obscure worker, Hans Wach, has invented a simple device to utilize exhaust steam on steam boats. *Already, the report states, the steam ship lines have saved more than $15,000 in fuel bills with his invention.* Almost in the same breath the Dept. of Commerce announces that it will soon test out a new non-crashable aeroplane, which the average man can learn to fly in a day, which will travel at 110 miles an hour and sell at the price of a cheap automobile. An unknown Seattle man has invented a robot to go 5,000 feet under the sea and recover millions and millions of dollars worth of gold lying at the bottom of the ocean since the days of the early Spaniards.

Remember this: For every outstanding big invention there are thousands of small, simple things for use in the home, the office, the factory, on the farm, on every sort of travel conveyance. Little articles like you find on the counters of a 10-cent store, hardware store, drug store, toy and novelty shop.

Many Little Ideas Have Big Commercial Possibilities

A person finds something he's using doesn't work right, or it's clumsy, or costs too much. He gets a happy thought. He improves the old Article. That's contribution to human progress. That's the way that many, many men have reached the goal of financial comfort, independence and even wealth. Most of the things millions of us use didn't come from the brains of engineers and physicists. They came from the mind and maybe the crude home work bench of Mr. Average Man, busily engaged in earning his bread and butter at whatever chance or circumstance has given him to do. The "little" man's opportunity as an inventor was never greater than it is today.

Who Are Inventors?

You'd be amazed at the men we contact in the course of a busy year. Most of them do not consider themselves inventors at all. During their work or leisure they get an idea. They work it out on paper. They get in touch with us about Protection. Did you know that a dentist invented the stock ticker, a school teacher the telephone, a farmer the typewriter, an artist the telegraph? Did you know that the crinkly hair pin—sold by millions now—came about because a husband saw his wife twisting the old-fashioned straight hair pin to make it stay in place? Poor men who have no thought of invention now will be financially well-fixed in a few years because of a happy thought that the world could use to advantage.

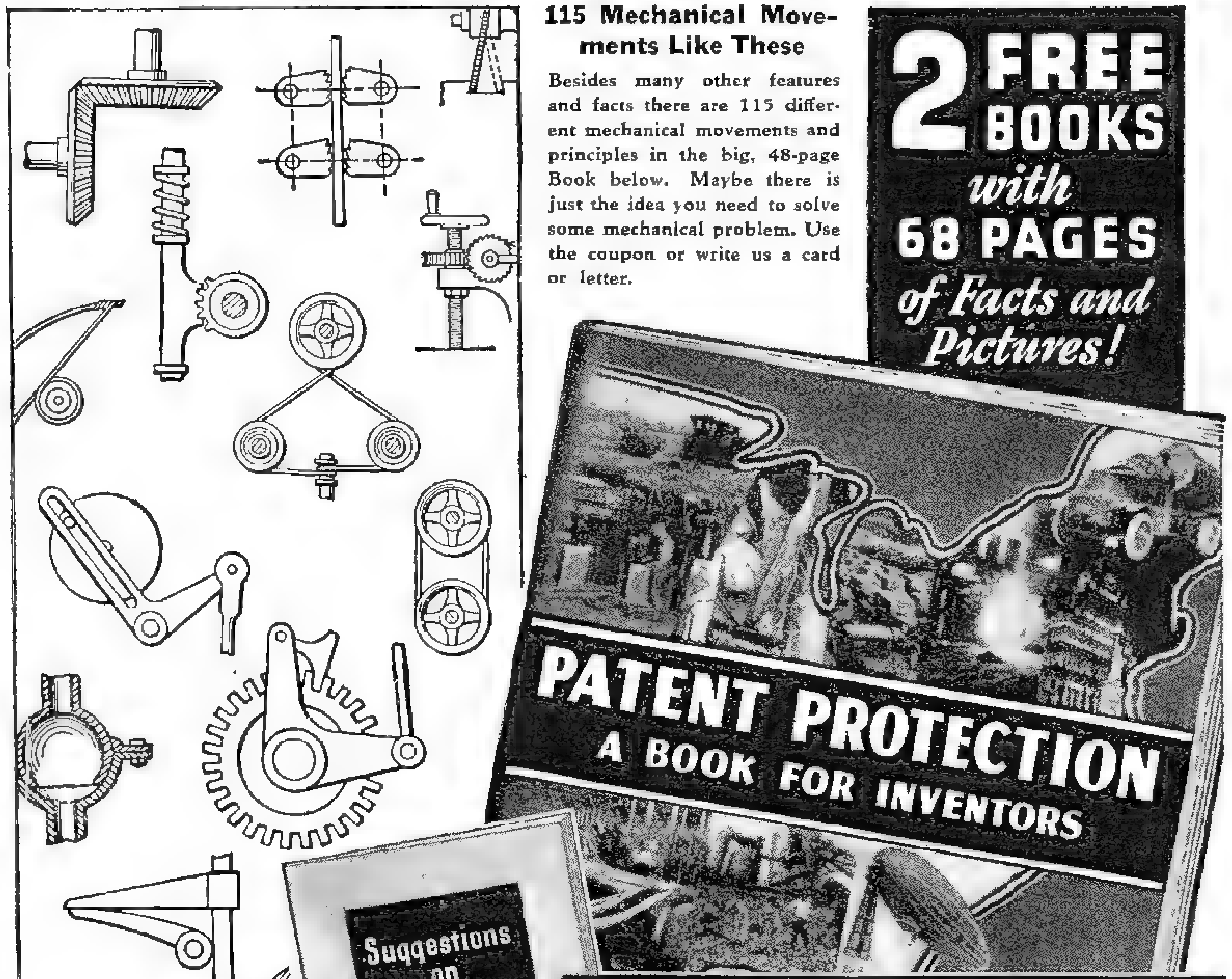
Can You Answer These Questions?

Ask yourself these questions: How do the Patent Laws protect me? What easy steps can I take, without cost, to put myself in position to support my belief that I am the *first* man to think of *my invention?* Is a Patent worth the cost? Do I need a model? Should I try to sell my invention before I have it Patented? Is there any safe, business-like way to secure financial help? If I do apply for a Patent how shall I reach people who can market my invention? Can I protect and sell an improvement on some invention that has already been patented? These are but a few of the questions which usually confront the average man. You need the answers! YOU CAN HAVE THEM, without cost, trouble, or delay.

Our Business Is To Help You. Write Us Today

For more than forty years, this firm has been helping men with an inventive turn of mind. We maintain a large staff of trained, experienced specialists—Registered Patent Attorneys, Draftsmen, and Searchers to help our clients secure all the protection to which they are entitled. Fees are reasonable. Deferred payments frequently arranged. Questions promptly answered. Write us frankly with absolute assurance that what you say will be treated with strictest secrecy. But FIRST, send for the FREE BOOKS shown on the opposite page. They are filled with facts, pictures and suggestions. They tell you things about Patents, Inventions and Selling Inventions that we have learned in our long experience. They may save you time, expense, EVEN LATER DISAPPOINTMENT. Simply fill in the coupon. No charge, no obligation. Write us today.

RUSH COUPON TO WASHINGTON, D.C. TODAY



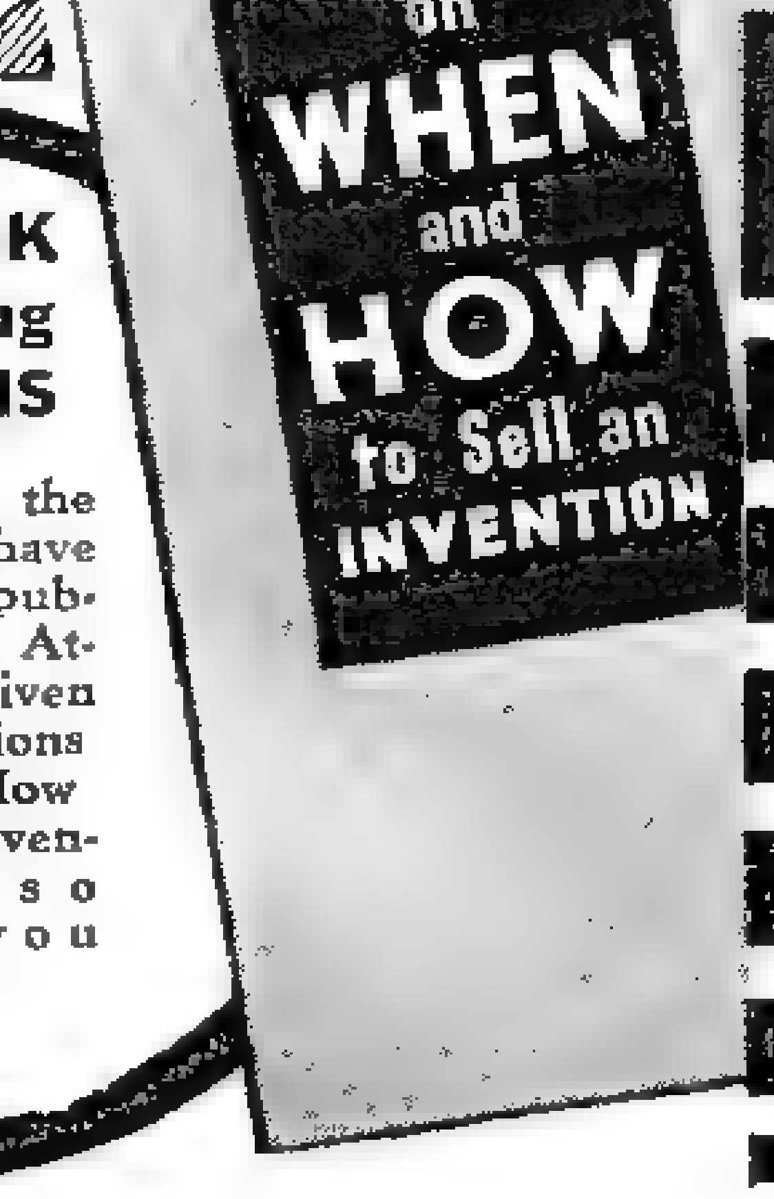
2 FREE BOOKS with 68 PAGES *of Facts and Pictures!*

115 Mechanical Movements Like These

Besides many other features and facts there are 115 different mechanical movements and principles in the big, 48-page Book below. Maybe there is just the idea you need to solve some mechanical problem. Use the coupon or write us a card or letter.

NEW BOOK About Selling INVENTIONS

So far as we know, the facts in this booklet have never before been published by any Patent Attorney. You are given very definite suggestions on "When and How to Sell an Invention." It also comes to you FREE.



VICTOR J. EVANS & Co.

REGISTERED PATENT ATTORNEYS

MAIN OFFICE: 30-E, VICTOR BUILDING,
WASHINGTON, D. C.
Other Offices: 2610-B, Singer Bldg., New York
1145-B, Monadnock Bldg., Chicago
1010-B, Hobart Bldg., San Francisco
405-B, Garfield Bldg., Los Angeles

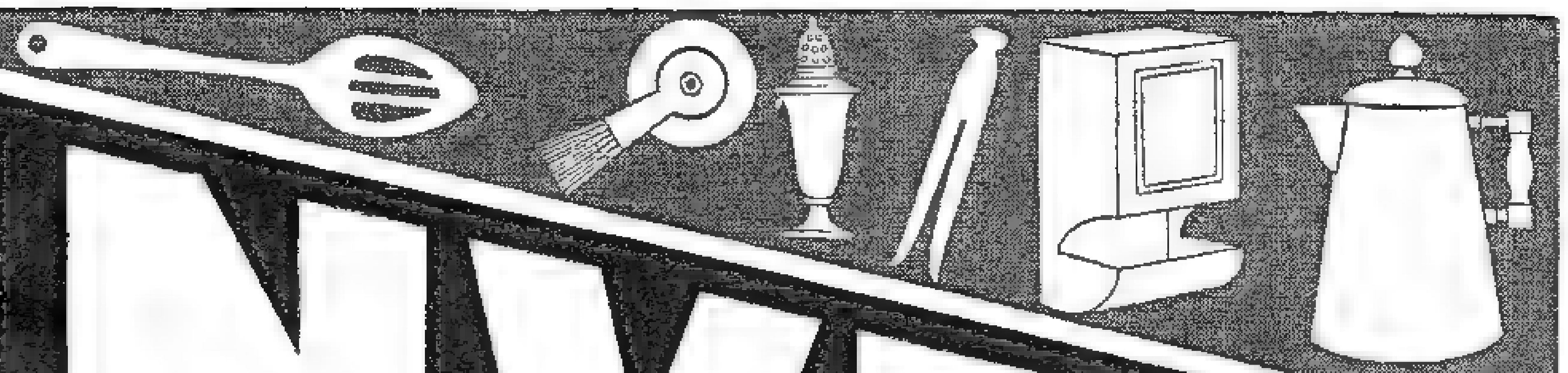
Send me FREE copies of your books, "Patent Protection" and "When and How to Sell an Invention." (Note: Same books supplied by any of branch offices listed above.)

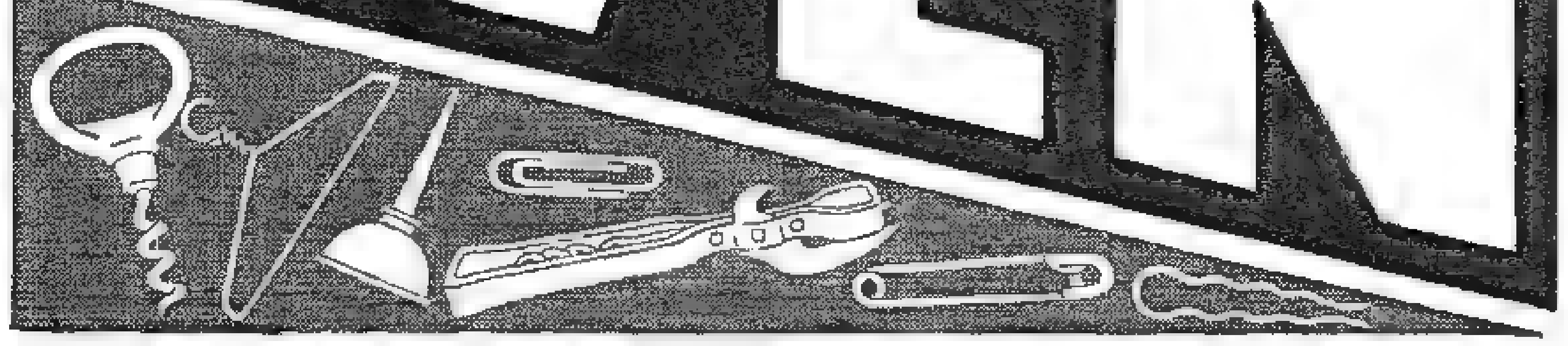
Name ....

Street and No. ....

City or Town .... State............

INVEN-

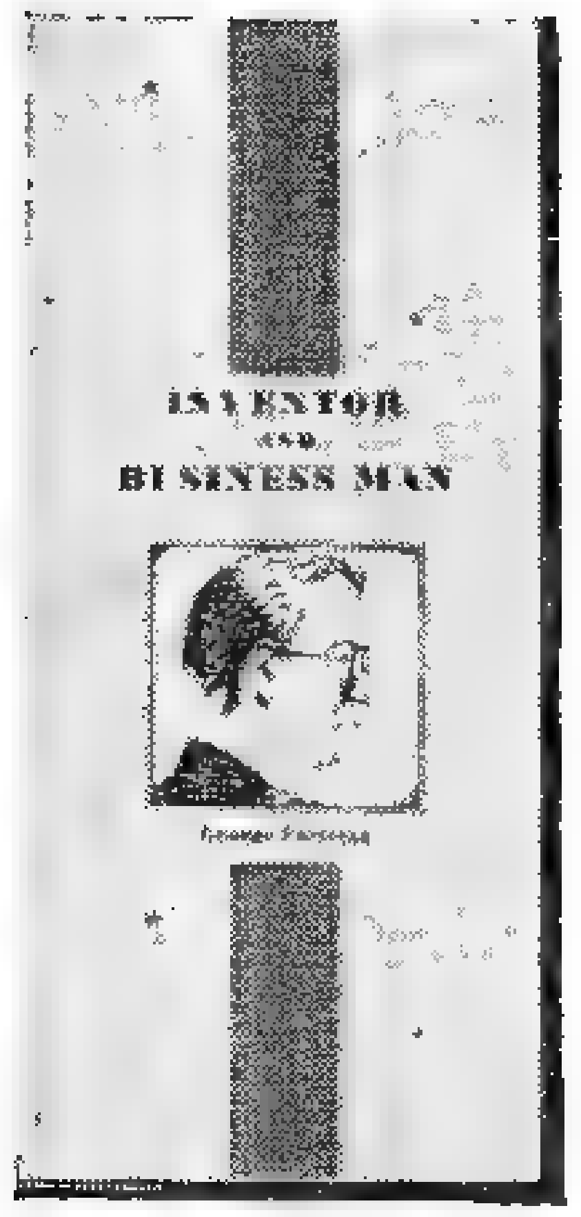




Small Inventions THAT HAVE BUILT BIG BUSINESSES

INVENTIONS do not have to be complicated to be profitable when Patented. The 5c and 10c stores flourish on simple Patented products which are commercially successful. The zipper, safety pin, thumb tack, paper clip, collar button—all simple, yet familiar inventions—brought their inventors rich rewards. If you have a Patentable invention—act to protect it. Many of the most useful, widely popular, greatly profitable, and extremely successful inventions have been very simple ones. You have only to look at the devices we have pictured here to realize how a simple invention may become a utility bought by a hundred thousand or a million people soon after it is produced. Don't be afraid that the simplicity of your invention makes it valueless. The thing that you find so simple that you wonder why a thousand other people haven't already done it is often the invention worthwhile.

HOW OTHER INVENTORS GOT STARTED



The list of men who succeeded in invention with only a poor boy's start is a very long and noble one. Poverty, hardships, lack of friends, distance from the market—these could not hold back Bell, Edison, Eastman, McCormick, Whitney and others. Everyone cannot succeed. But every man can try. Courage, sacrifice, and hard work may bring you a measure of the success these men had. Lack of mechanical ability is not a serious drawback. You can always get someone able to build a model, draw a detailed design, or otherwise materialize your invention for you. The big drawback is discouragement.

Your invention of a practical article or an improvement upon an old one should be patented NOW. Frequently many of the thousands of applications filed in the U. S. Patent Office each year are for the same or almost the same invention. In such a case, the burden of proof rests with the last application filed. Sometimes a delay of even a few days in filing the application means the total loss of the patent. LOSE NO TIME.

The entire time of this large and experienced organization is devoted exclusively to patent and trade-mark cases. We know the rules and requirements of the Patent Office. We understand the technicalities of Patent Law. We can proceed in the quickest and safest ways in preparing an application for a patent covering your invention.

FREE **THE BIOGRAPHY OF GEORGE EASTMAN**

Views of the man who used Patent Protection to amass millions and give perfection to a new art—*Photography*—itself one of the greatest inventions.

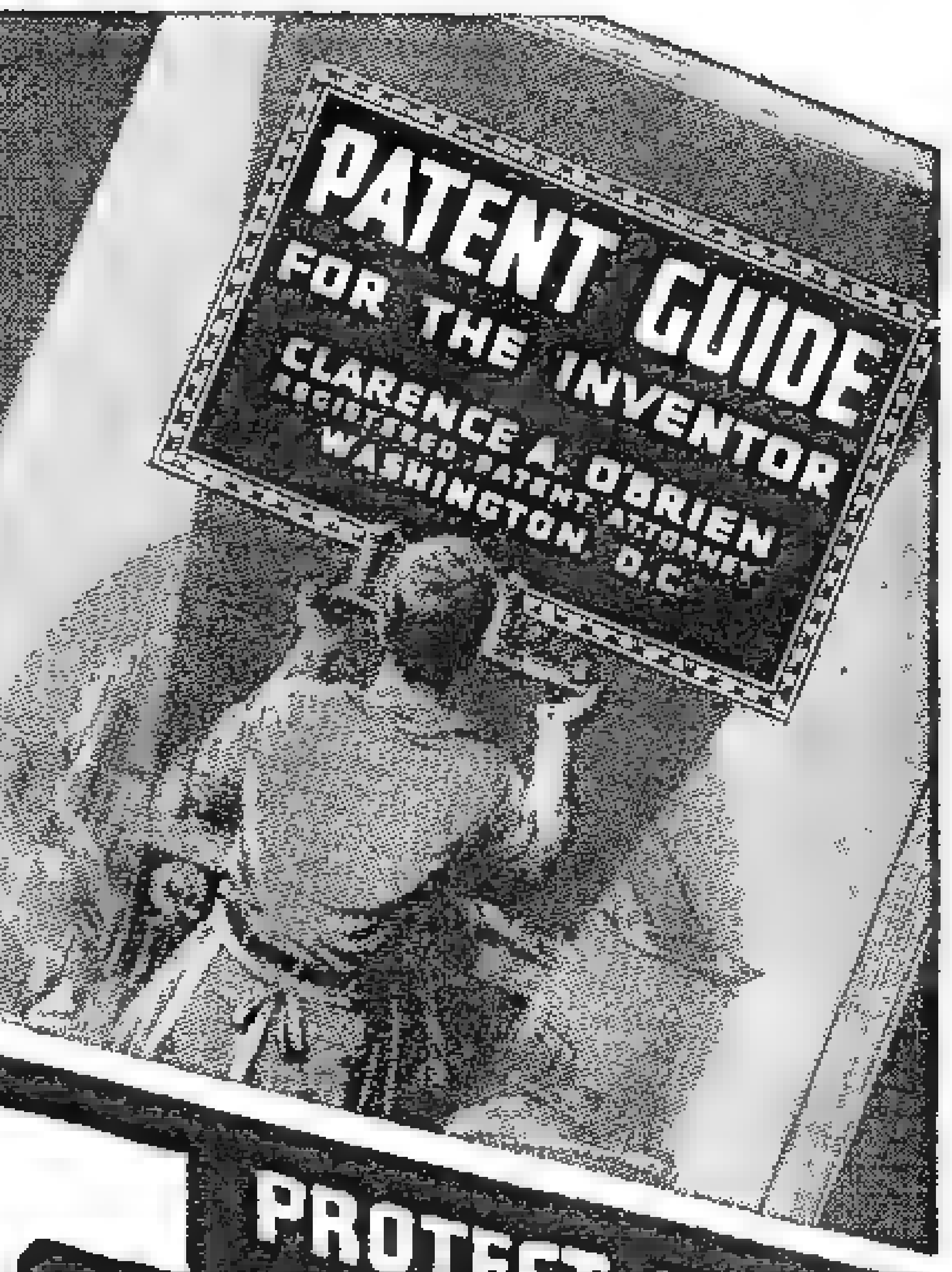
CLARENCE A. O'BRIEN & HYMAN BERMAN

317-C ADAMS BUILDING **WASHINGTON, D. C.**

Registered Patent Attorneys Before U. S. Patent Office

Send For This

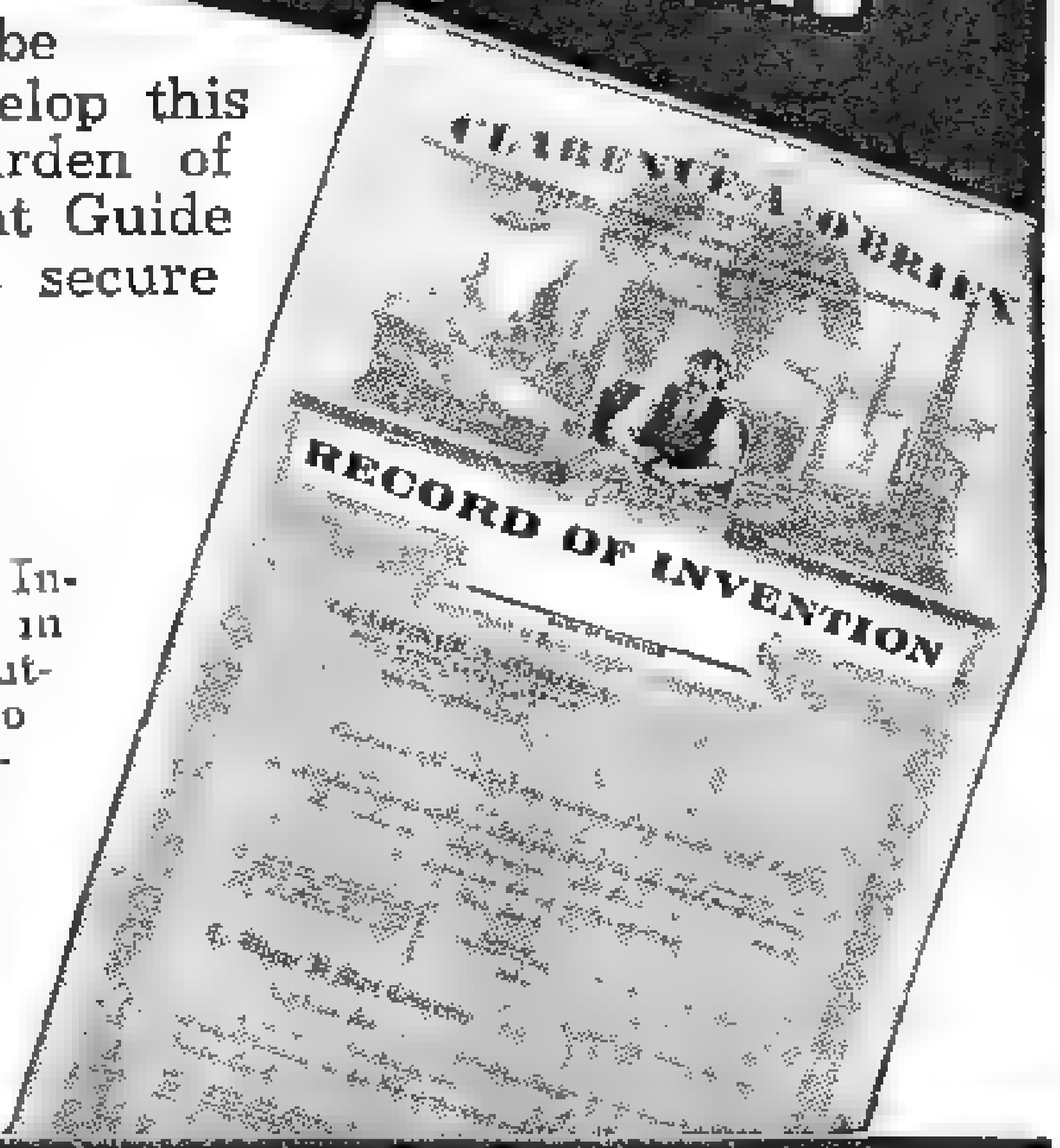
FREE BOOK



-TORS

PROTECT YOUR INVENTIONS WITH U.S. PATENTS

If you have an invention that is patentable—and want to secure for yourself your inventor's sole right to profit from the invention—you can't afford to lose time in securing the protection of a U. S. Patent. Other inventors may be working on the same invention right now. Should they develop this invention and file patent application before you do—the burden of establishing priority will be upon you. Our Big Book—"Patent Guide for the Inventor"—will tell you the quickest possible way to secure Patent Protection for your invention. SEND FOR IT TODAY!



The First Important Step in Securing a Patent

is to obtain the services of a Registered Patent Attorney. The U. S. Patent Office advises that you secure the aid of an experienced Registered Patent Attorney to prepare your statements. Establish the date of your invention as explained in our book and disclose your invention to him in correct form. He then makes a SEARCH of the Patent Office Records and reports to you on existing U. S. Patents which might bear on your invention, giving his opinion on the advisability of proceeding and filing formal application.

Reasonable Fees—Convenient Terms

Don't worry about finances. Our fees are very reasonable—we can arrange convenient terms of payment. It is our custom to permit clients to pay for our services in installments as the application progresses in our office. See our Big Book for fees in obtaining Patent. It explains our arrangements clearly. Send for it NOW!

FREE RECORD OF INVENTION FORM

Use our Free "Record of Invention" form to assist you in recording the descriptive outline of your invention and to establish the date of your invention. With it you can make a rough sketch of your invention and have it witnessed in a matter of value to you as evidence should occasion arise.

CLARENCE A. O'BRIEN and HYMAN BERMAN

317-C Adams Building, Washington, D. C.

Registered Patent Attorneys
Before U. S. Patent Office

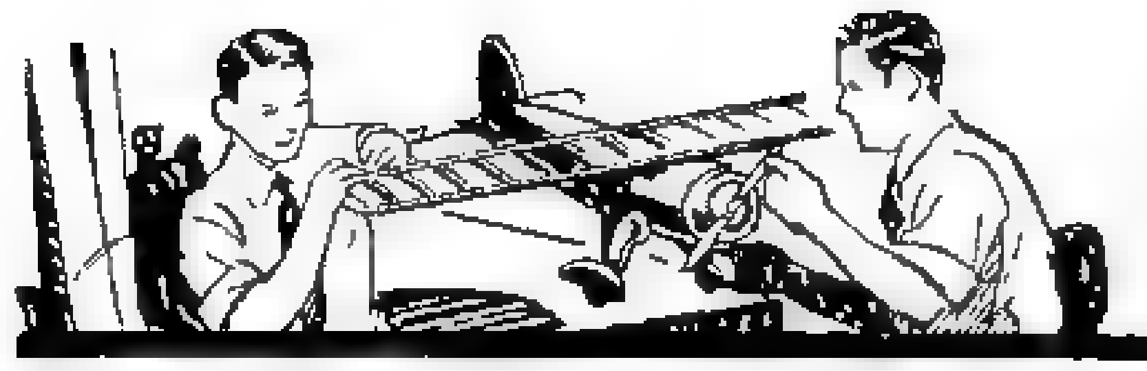
Please send me at once your Big Free 48-Page Book, "Patent Guide for the Inventor" and your Specially Prepared "Record of Invention" form. This request does not obligate me.

Name ....

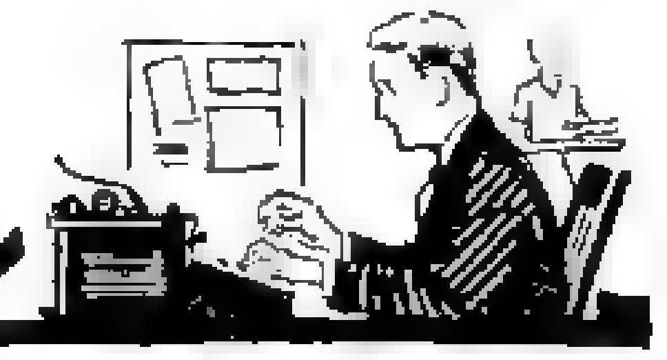
Address ....

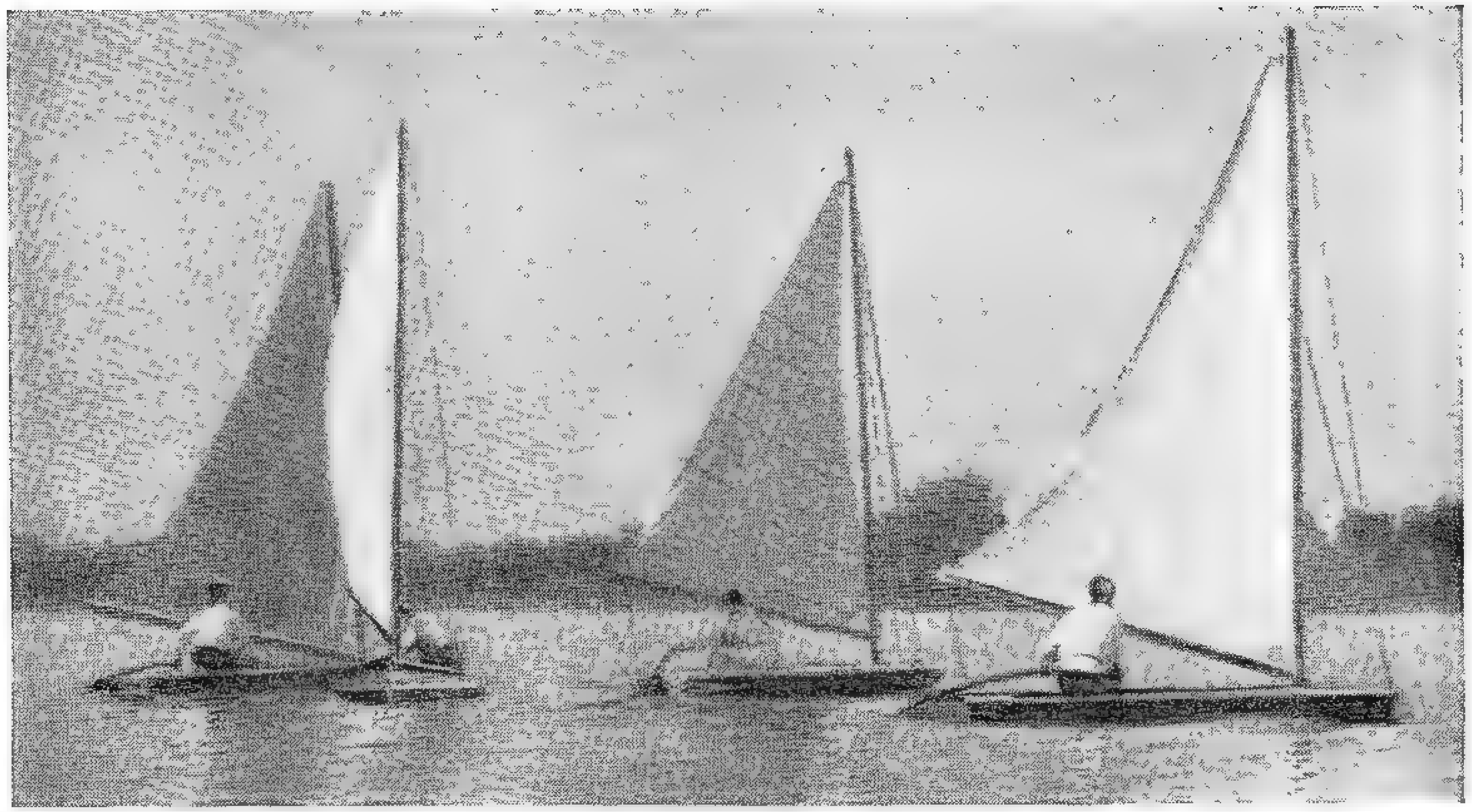
....

(Please write or print plainly)



Chips from the Editor's Workbench





"When good fellows get together"—a fleet of four "Little Bear" boats constructed from MM plans by Minnesota fans.

PHOTOS of boats of all types and sizes from kyacks to sailboats as well as power boats featuring outboard, inboard and propeller-drive motors have flooded the Workbench this month, so in response to this expression of popular interest in home-built boats we are devoting the entire space to the subject.

* * *

Norman Schauer, of St. Paul, Minn., was awarded first prize of $5, for his letter and photo describing a fleet of MM boats. The letter reads:

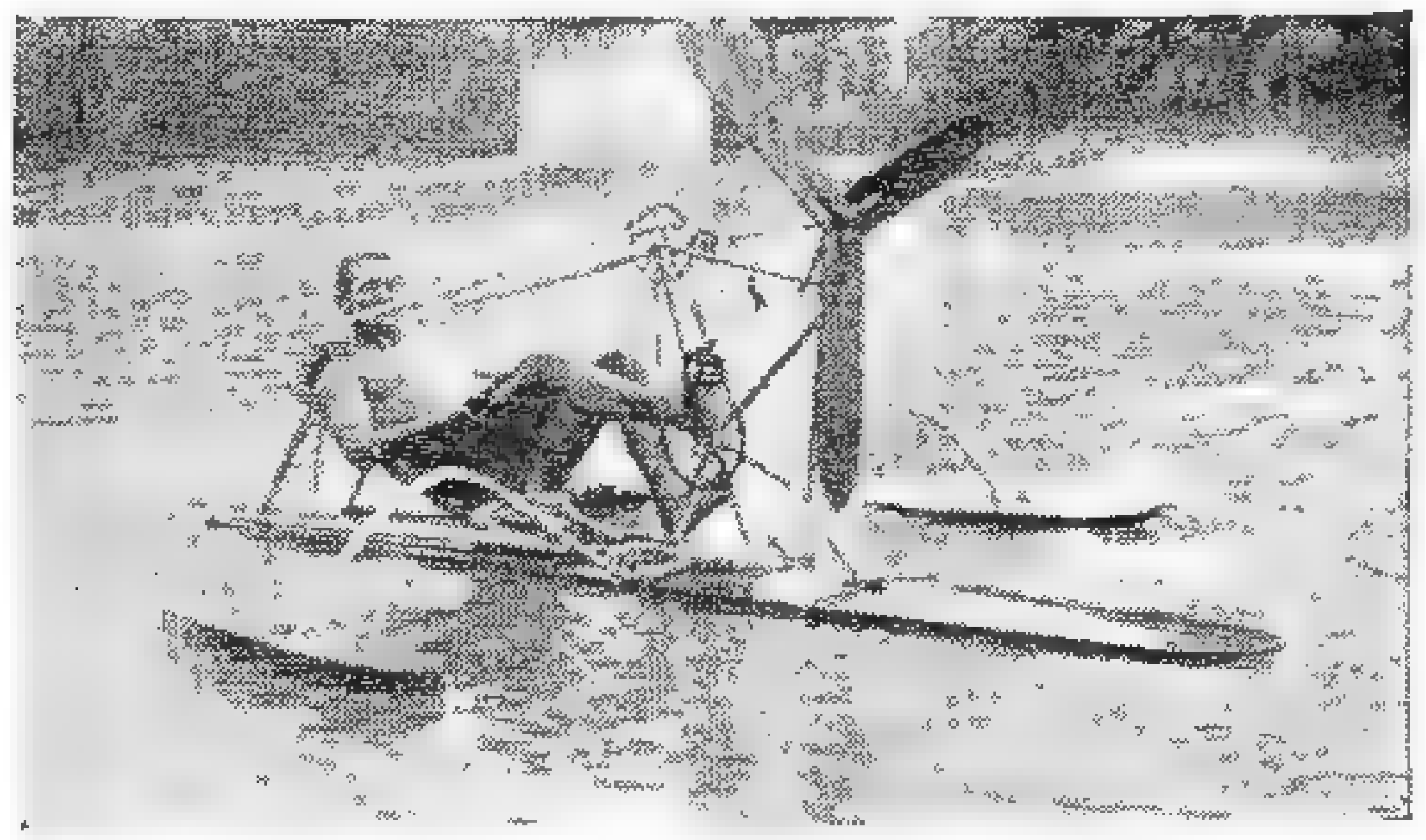
> Dear Editor:
>
> I am sending you a photo of four "Little Bear" boats constructed by George and Art Maguire, John A den and myself, all of St. Paul. We thought you might be interested in the photo as the boats were built from plans in the MM book—"How To Build 20 Boats," 1936 issue.
>
> We are organizing a boat club and will soon have ten "Little Bears." Hoping for more plans for small boats in the future, I am,
>
> Norman Schauer.

Good work, fellows. The club angle sounds like a good idea and the 1938 MM boat book ought to interest your entire group. Copies are available from our Greenwich, Conn., office at the usual price of 50c per copy.

A photo and letter describing a very novel water craft won a $3 award for Fred Pilates, of St. Louis, Mo. He says:

> Dear Editor:
>
> As a physical culture specialist and a constant reader of MM I developed the "aircycle," shown in the enclosed photo. It is constructed of bicycle parts, mounted on a surfboard which is balanced on pontoons. Total weight is 30 pounds.
>
> Fred Pilates.

We have a strong hunch that reader Pilates will receive many inquiries from MM readers asking for construction details of his unusual craft.



Mounting parts of a bicycle on a surfboard balanced by pontoons, Fred Pilates constructed this novel "aircycle" boat.

An interesting letter from far away Australia won a $3 award for H. V. Kenna. He writes:

> Dear Editor:
>
> I am a very keen reader of MM, especially the Editor's Workbench, and feel that I am at last eligible to write to you as I have completed my version of "Whizzer," the plans for which appeared in the MM boat book. The craft is powered by a motorcycle engine, fitted with a propeller of my own design and construction, and attains a speed of 20 m.p.h.
>
> H. V. Kenna.

Inasmuch as reader Kenna is a licensed airplane pilot, it was almost natural that "Whizzer" would tempt him as a construction project and he has certainly turned out a first class job.

* * *

Outboard fans will undoubtedly be interested in a letter and photo sent in by Warren Mathews, of Bound Brook, N. J., who also was awarded a $3 prize. He says:

Driven by an airplane propeller fitted to a motorcycle engine mounted at rear, H. V. Kenna's "Whizzer" travels 20 m.p.h.

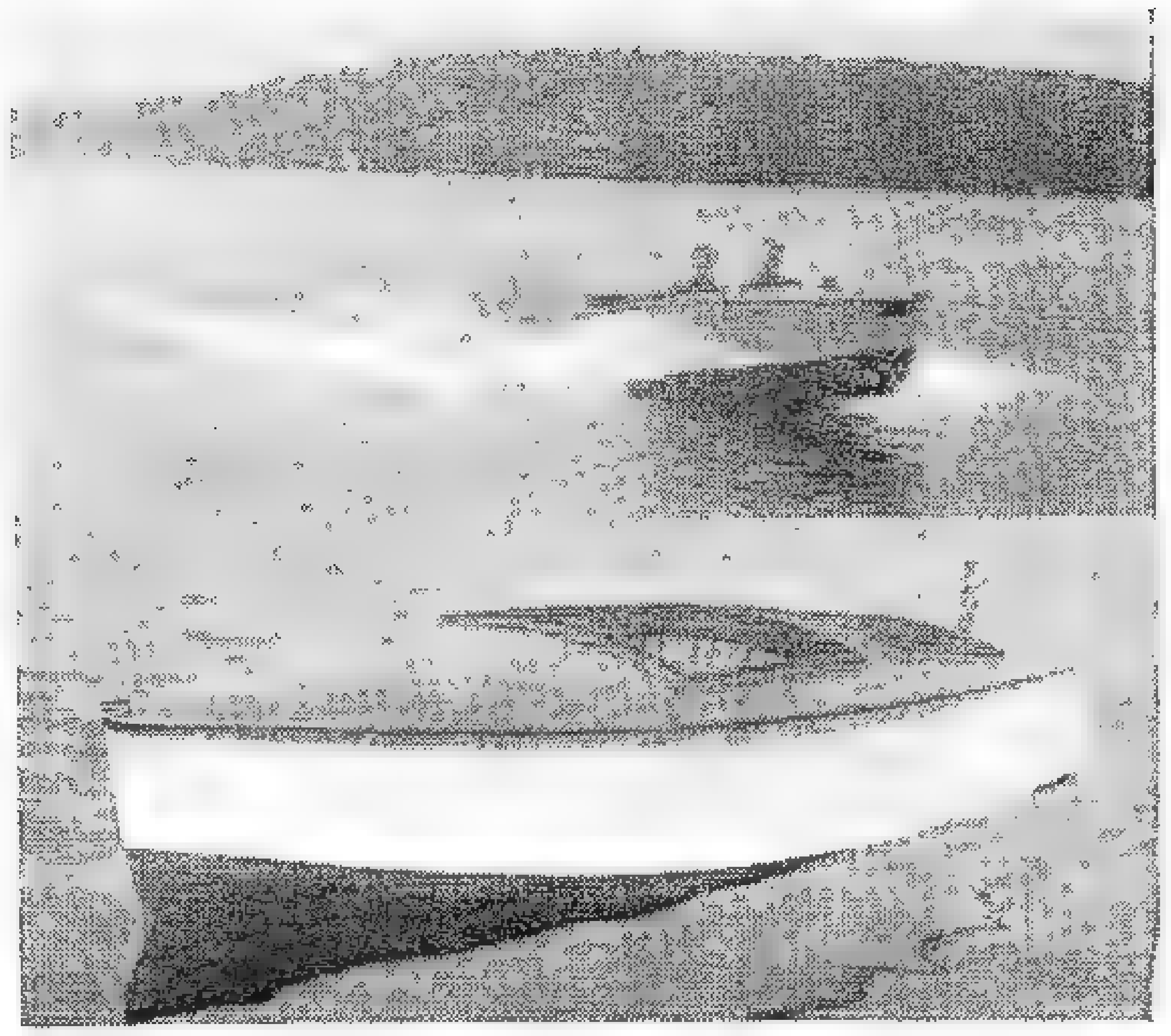
> Dear Editor:
>
> The enclosed photo shows "Buzzer," built to MM plans. It travels about 22 m. p. h., powered by a 25 horsepower outboard engine. My next project will be an inboard job, built to your plans.
>
> Warren Mathews.

Your "Buzzer" rivals many commercial boats in its appearance, Mathews, and we compliment you on your craftsmanship.

* * *

Another Minnesota reader who was awarded a $3 prize this month is James W. Spoor, of Cloquet, whose letter reads:

> Dear Editor:
>
> I am enclosing photos of a round bottom boat of my own design. It handles well with a 16 horsepower outboard and one of the photos shows its stability.
>
> I enjoy MM every month, especially the construction projects. Let's have more boat plans.
>
> James W. Spoor.



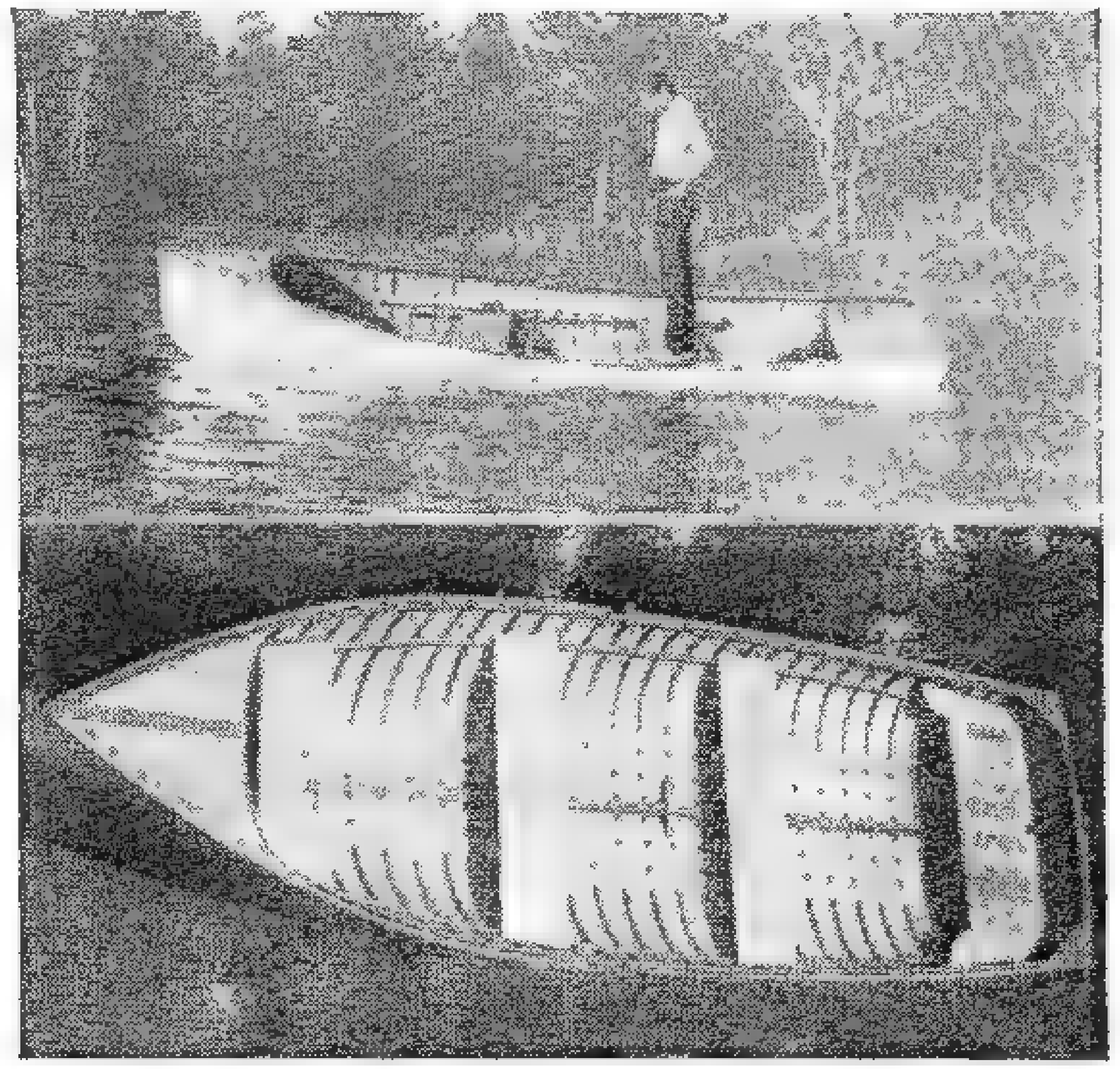
Warren Mathew's "Buzzer" outboard motorboat not only looks well, but sails well, too, judging from the above photos.

Spoor's boat certainly reflects his excellent knowledge of boat construction. However, with good plans and a few simple tools, reader, you, too, can build a small boat that will insure many healthy and happy outdoor hours during the coming summer months.

* * *

A letter and photo describing a home-built MM kyack won a $3 award for Bob Nissley, of New Brunswick, N. J. His letter states:

[*Continued on page* 31]



James W. Spoor's home-built 15-foot round bottom boat is so stable that a man can stand on the gunwale (top) without capsizing it. Lower photo shows construction details.

Chicago; KSD, St. Louis; WHO, Des Moines; WGH, Norfolk, Va.; WHK, Cleveland; KSTP, St. Paul; KMJ, Fresno, and KFPK, Sacramento.

The facsimile recorder will be sold at a price no higher than the average good broadcast receiver. When production is increased the price is expected to be reduced to that of the average medium priced midget receiver. With the exception of the recorder, no special equipment is required except the broadcast receiver itself.

This new medium of entertainment and education is not to be confused with television, differing most widely from it in that its operation produces a tangible newspaper on which appears the printed word, photographs, drawings, sketches and even advertisements. As the newspaper is produced, it can be removed from the machine and preserved if desired, differing from the conventional type only in size.

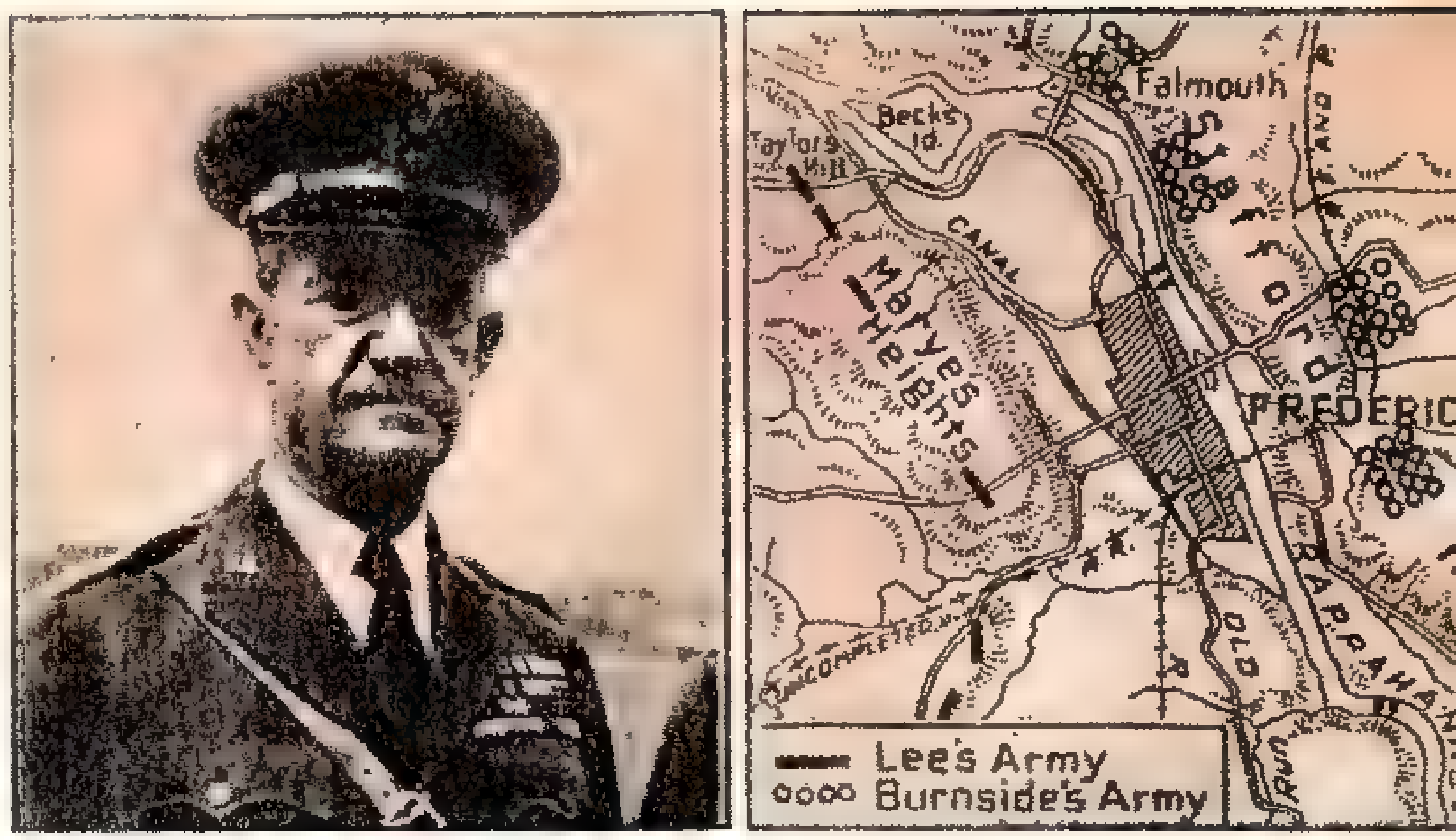
Briefly, the operation of the transmitter and recorder is as follows: The copy to be transmitted—whether it is pictures, news flashes, line drawings or comic strips—involves no special printing or preparation because the material itself can be inserted directly into the transmitter. An electric bulb, throwing a spot of light, moves back and forth across the copy to be transmitted. This action is similar to that of the human eye as it sweeps from left to right across a line of type. In its movement across the copy, the spot of light is reflected back into a light-sensitive photo-electric cell. When the scanning light strikes the white portions of the copy, it returns a full reflection to the light-sensitive cell. When it strikes a black area, no light is reflected, while for the shaded areas, a corresponding reflection is obtained.

Because of the action of intermittent light at the cell, these reflections are changed into electrical energy or impulses. At the receiver or recorder, these impulses operate a stylus sweeping in synchronism with the scanning light at the transmitter. Thus a "black" impulse will cause the stylus to make a black mark on the paper while a "white" impulse will not cause a mark.

Radio facsimile service, as it is being considered by broadcasters, probably will supplement existing sound broadcast programs. It is planned that pictures and text will be broadcast on standard broadcast wavelengths during the early morning hours, between midnight and dawn, so that a complete bulletin will be ready for the user when he arises in the morning. A number of ultra-short wavelengths for day and night services also have been set aside.

The FCC requires that each experimental station install a minimum of fifty receiver-printers for each facsimile scanner-transmitter. The experimental programs will determine, among other things, public reaction to facsimile broadcasting as a radio service, the best type of program material, and the technical requirements for both scanner and receiver.

In use, the printer will be turned on automatically by a time clock in accordance with a pre-determined transmission schedule. In the same way, the printer is turned off in the morning when the facsimile transmission is completed. At this point, a really up-to-the-minute newspaper has been printed.



Here are examples of pictures and maps produced by the RCA facsimile recorder. Although facsimile had been used experimentally by the army, it had never been adopted for regular use. In time of war, small portable receivers and recorders could supplv maps to widely separated groups at the same time.

Inventor William G. H. Finch holding a newspaper printed by the recorder he developed. Below, right is shown the printing section of the Finch recorder. The arm swings back and forth across the paper in synchronism with the beam of light scanning the copy at the transmitter. While television remains hiding around the mythical "corner," facsimile brings news, photographs, sketches, and drawings into the home today.

Charles J. Young, RCA Victor engineer, with the facsimile receiver-printer he has developed for home use. Ordinary white or newsprint paper and carbon paper are utilized for reproduction.

New York WORLD'S FAIR TAKES SHAPE

29
28
9
21
22
10
11
7
6
24
8
23
12
5
4
3
13
2
20
24A
19
18
1
14
15
25
26
16
17

(Photo by Fairchild Aerial Survey)

Aerial view of the Central Exhibit Area, Flushing Meadow, N. Y., showing the rapid progress being made in the construction of exhibit buildings.

1. Administration
2. Communications
3. Business Administration
4. New York City Building
5. Theme Centre—foundations and paving for Perisphere & Trylon
6. Mining and Metallurgy
7. Consumers
8. Medicine and Public Health
9. Food—focal exhibit
10. Fisheries
11. Food
12. Shelter—focal exhibit
13. Textiles
14. Stores—warehouse
15. Utility—operations
16. Test Building
17. Employment Office
18. North Substation—power
19. Fire, Police, First-aid—Station 1
20. Field of Flags
21. Fire, Police, First-aid—Station 2
22. Empire State Bridge—over Horace Harding Boulevard
23. Beginnings, Distribution Building
24. Overpasses—Grand Central Parkway

24A. Extension, new level

25. Temporary station, Long Island Railroad
26. Corner of Transportation Zone
27. North end of Amusement Zone
28. Court of States site
29. Portion of Government Zone

(Please turn to next page)

U. S. NEEDS PLANES and MEN

by

Brigadier General H. H. Arnold,

Assistant Chief of the Air Corps, U. S. Army

No "swivel chair" pilot, but a real flying officer is Brigadier General H. H. Arnold, above.

Clarifying a maze of claims and counter-claims, Brigadier General Arnold evaluates the Air Corps.

The newly developed twin-engined Curtiss Y1A-18 mid-wing plane (above) represents a startling change in attack plane design.

WAR stalks abroad in more than one unhappy land today. The threat of war is immediate and sleep-disturbing in some other nations not now actually engaged. Armaments, land, sea, and air are being built up with unprecedented acceleration in every corner of the earth. One new note, one recent trend, is distinctly discernable in the present arms race not apparent in any of those which have gone before; that is the greater emphasis on air forces and their equipment. A distinguished military authority recently pointed out that England, Germany and Italy at least, of the world powers, were spending more of their rearmament funds on aviation material than on either their armies or their navies.

At such a time it may not be amiss to take stock of our own air arm, to examine critically and carefully the state of effectiveness of our own Air Force. "Is our military aviation," well may the patriotic taxpayer ask, "equipped, trained and qualified to guard our sky frontiers?" Let us make a searching appraisal, looking toward a fair answer to this timely and much debated query.

In times past many writers and public speakers have deprecated the low standing of the United States among the world air powers. There has been much chiding and berating of our national fathers because of our so-called decadent air defenses. It was quite a shock to such critics recently, therefore, when no less an authority than Jane's in its annual work, "All the World's Aircraft," made the following statement about military aviation in this country:

"The United States has one of the biggest and possibly the most efficiently armed air services in the world."

There represented are the two extremes to the question. As usual, somewhere in between lies the true answer. Here it is as I see it. First, for a statement of the measurements by which we compare air forces. Their effectiveness depends upon a number of constituent ingredients. These are:

Airplanes: number, type, characteristics, accessory equipment.

Operating crews: number, type, and state of training—pilots, gunners, bombers, navigators, radio men.

Maintenance crews: number, state of training of maintenance men, for servicing, repair and overhaul of planes and engines.

Air bases: flying fields, shops, hangars, barracks, safe harbors for machines and men.

The state of the aircraft industry: how rapidly can reinforcements and replacements be supplied? What are the resources in raw material and personnel recruiting available?

Probable missions: Geographical location, isolation, probable adversaries, probable allies — war plans.

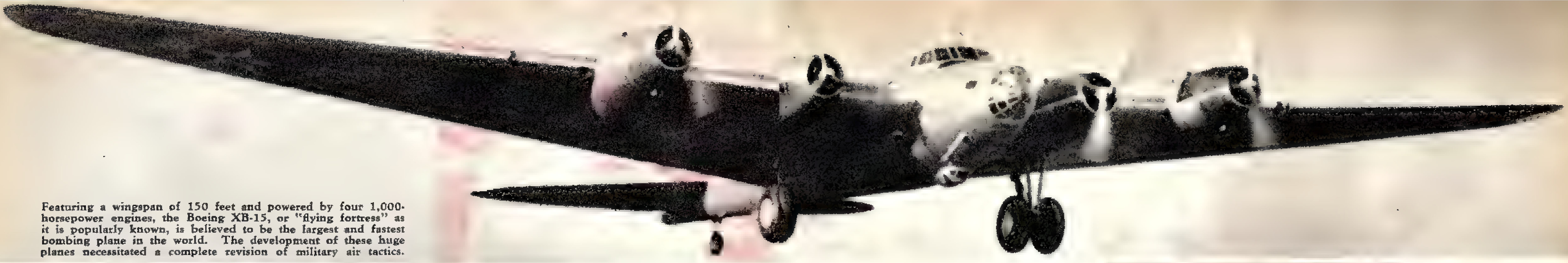
There you have the constituent variables—machines, men, bases, resources, missions — by these yardsticks shall we judge Air Forces.

We have more than one thousand modern fighting planes in our Army Air Corps, divided into the type categories, pursuit or fighters, bombers, attack, and reconnoissance and observation. These planes, type for type, are the equal of those found elsewhere in every case, and in several types we are distinctly superior to those possessed in quantity by any of the other leading air powers.

In this connection a word of warning is well sounded. Our present favorable position in airplane and engine development is

Performance figures are still a military secret, but 13 of these P-37 single-seater fighting planes (right) have been ordered by Army Air Corps

Designed primarily for attack tactics against huge bombing planes, the Bell "Airacuda" pusher-type fighting plane is armed with six machine guns.



Featuring a wingspan of 150 feet and powered by four 1,000-horsepower engines, the Boeing XB-15, or "flying fortress" as it is popularly known, is believed to be the largest and fastest bombing plane in the world. The development of these huge planes necessitated a complete revision of military air tactics.

Piloting is only one phase of the intensive training of a modern military flyer. Shown above is a cadet class at Randolph Field, Texas, practicing radio transmitting and receiving, or "buzzer" as it is termed by the student pilots, the messages being sent in dot-dash code.

Airplanes can't fly unless trained ground crews keep them in first class condition, so Uncle Sam trains mechanics, too (above).

due primarily to the funds and effort we have expended during the past twenty years in fundamental research and experimental engineering. During the years since the war, we in this country, the army, navy, National Advisory Committee for Aeronautics, Bureau of Air Commerce, and aeronautical industry combined to spend more money on fundamental research and aeronautical experimentation than any of the other nations. During the past year there has been ample evidence that several of the other powers realize fully the reason for our favorable position, for some of them are now expending vast sums on wind tunnels, experimental laboratories and engineering establishments. In three to five years, therefore, we may well expect, in fact it is a foregone conclusion, that these nations will surpass us in airplane excellence and performance. The only alternative is for us in this country to bestir ourselves and increase by at least one-half, and preferably double, our funds, resources and effort in aeronautical experimentation and research.

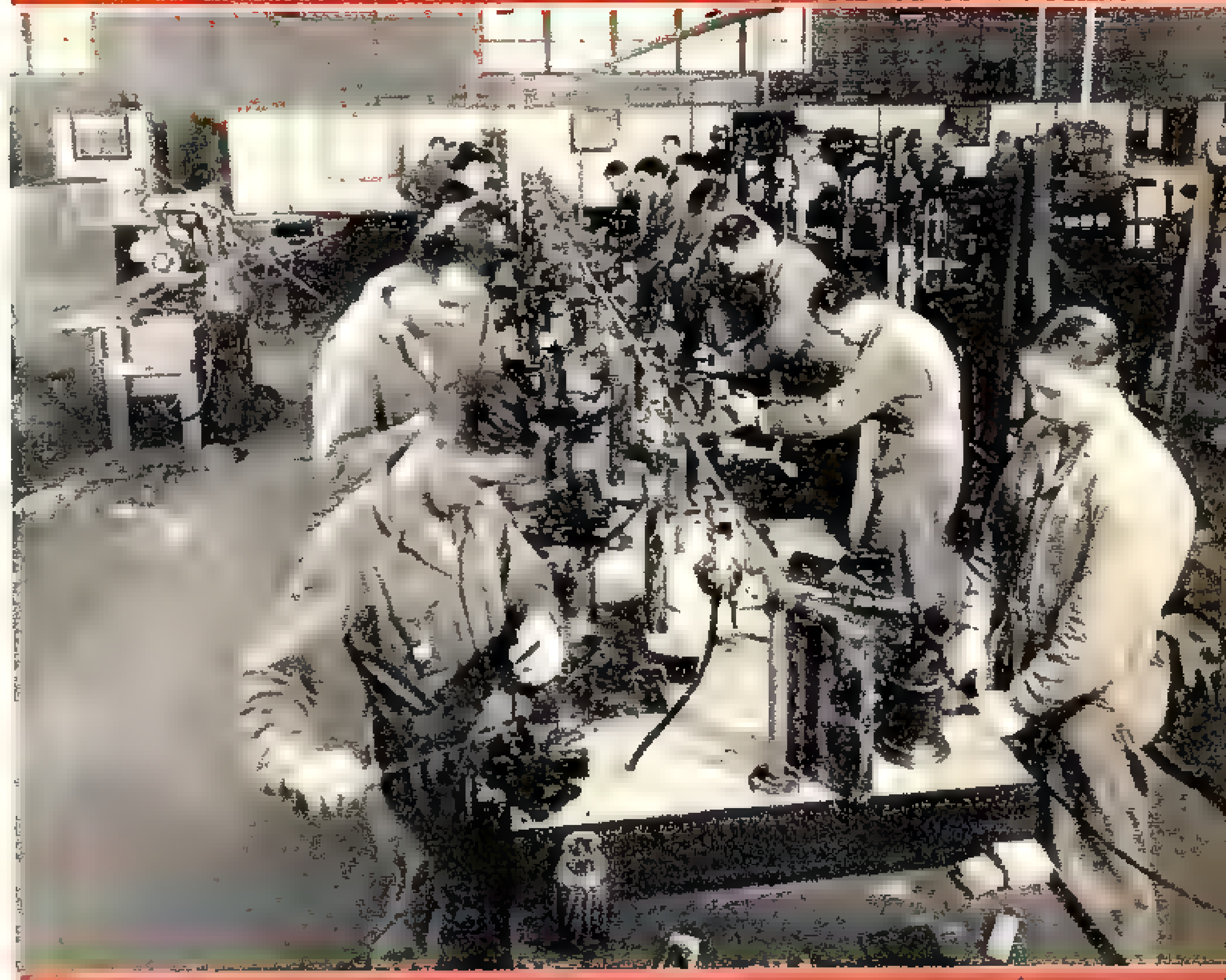
Today, however, our position is an enviable one. Our newer planes surpass, for the purpose for which designed, the prototypes found elsewhere. There is not a four-engined, long range, high performance, high capacity bomber abroad which its owners would not gladly exchange for our "Flying Fortress," the Boeing bomber. There is not a fighter in any land which has created the stir and been accorded the adulation and praise heaped on our Bell "Airacuda," multi-seater fighter, the world over. Our attack planes, of which the Northrop is the single engined version and the Curtiss A-18 the twin engine prototype, are preeminent in their fields. Our single seater fighters, Seversky P-35 and Curtiss P-36, are excellent pursuit planes. Some fighters may be found abroad slightly faster, but few, if any, possess all the many characteristics, many of them antagonistic the one with the other, as are combined into these sleek, little, metal air destroyers.

On the score of total numbers of military aircraft, five or six of the nations of the world exceed the United States, but we take no small comfort that on the score of quality and unit effectiveness, there is little question but that we go to the head of the class.

Air bases comprise an absolutely essential element in any effective air force. The finest planes in the world will be mired in the mud, inert and useless when needed, if proper bases are not available from which they can be cast into the air, groomed, manned, tuned up and armed for effective fighting might.

Millions of dollars have been spent by the Army during the past few years in an effort to provide up-to-date air bases. There has been much improvement in living conditions for officers and men; shops, hangars,

The "ground school" training of future Air Corps pilots involves attendance at lectures devoted to photography, navigation, aerodynamics and a score of allied subjects. Shown above is a class attending a lecture on the operation of various aerial bomb sights.

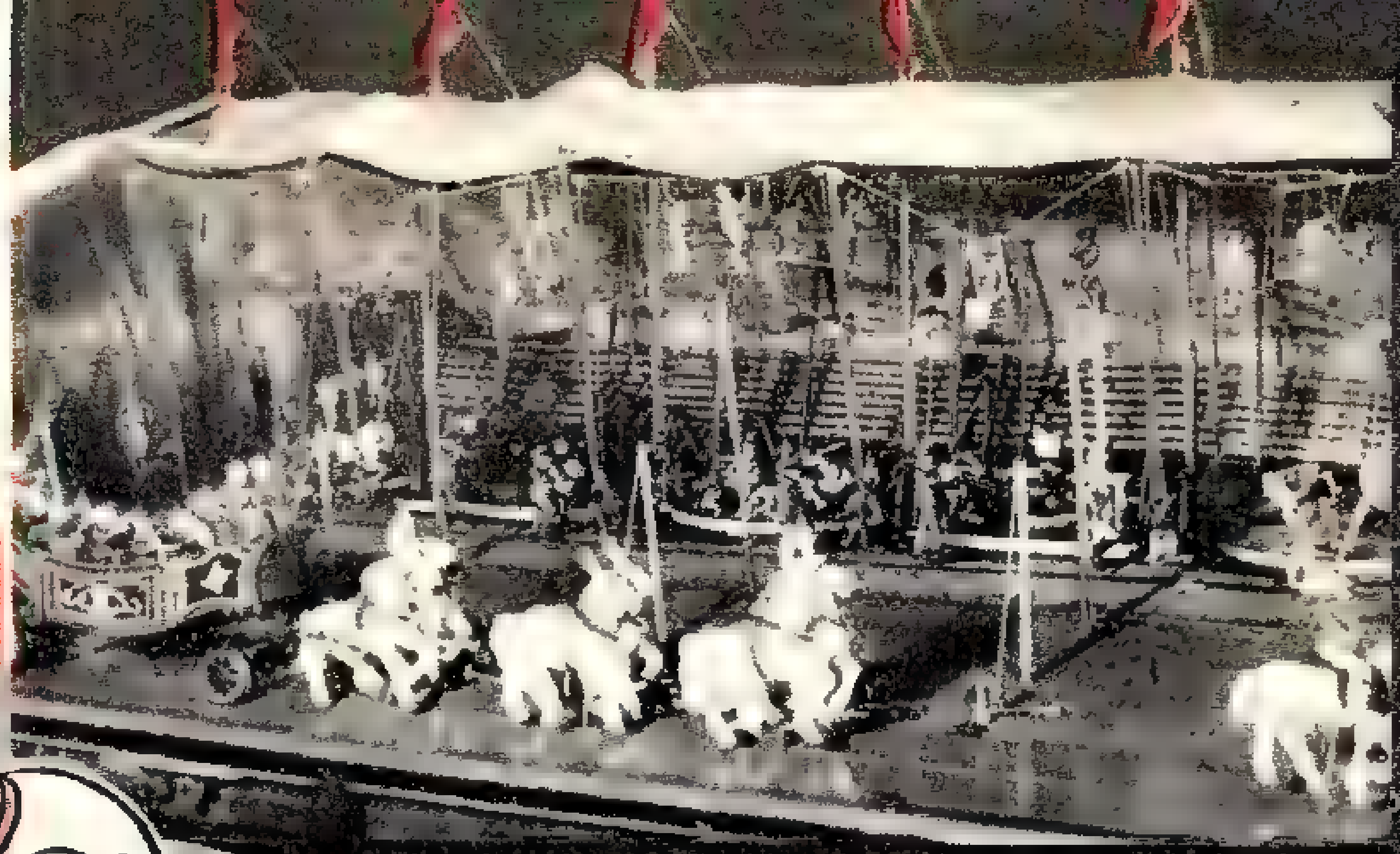


A class in soldering and brazing technique at the Air Corps Technical School, Chanute Field, Ill., is shown in photograph above.

Step right up, folks, and take a peek at—

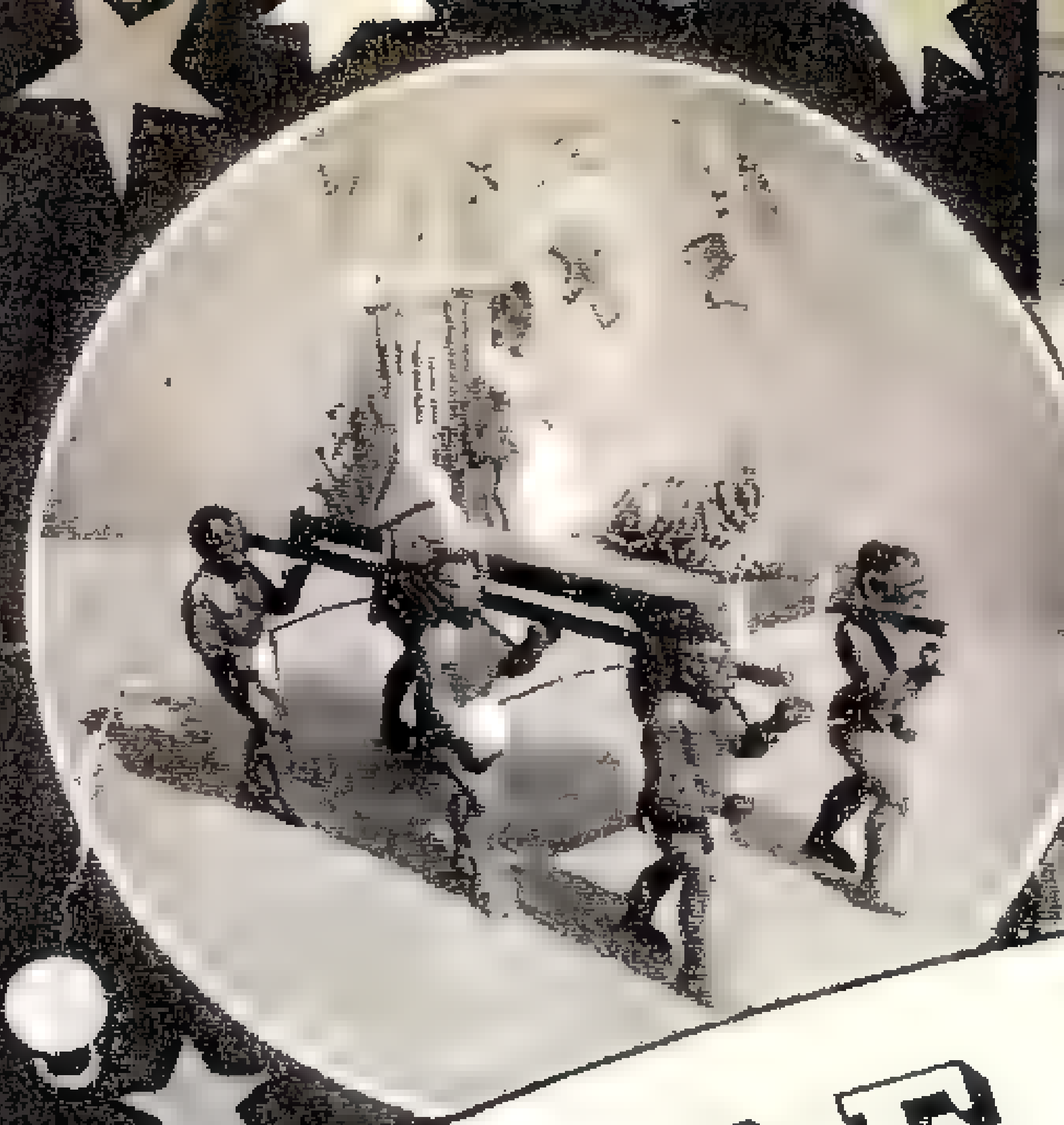
THE BIGGEST LITTLE SHOW ON EARTH

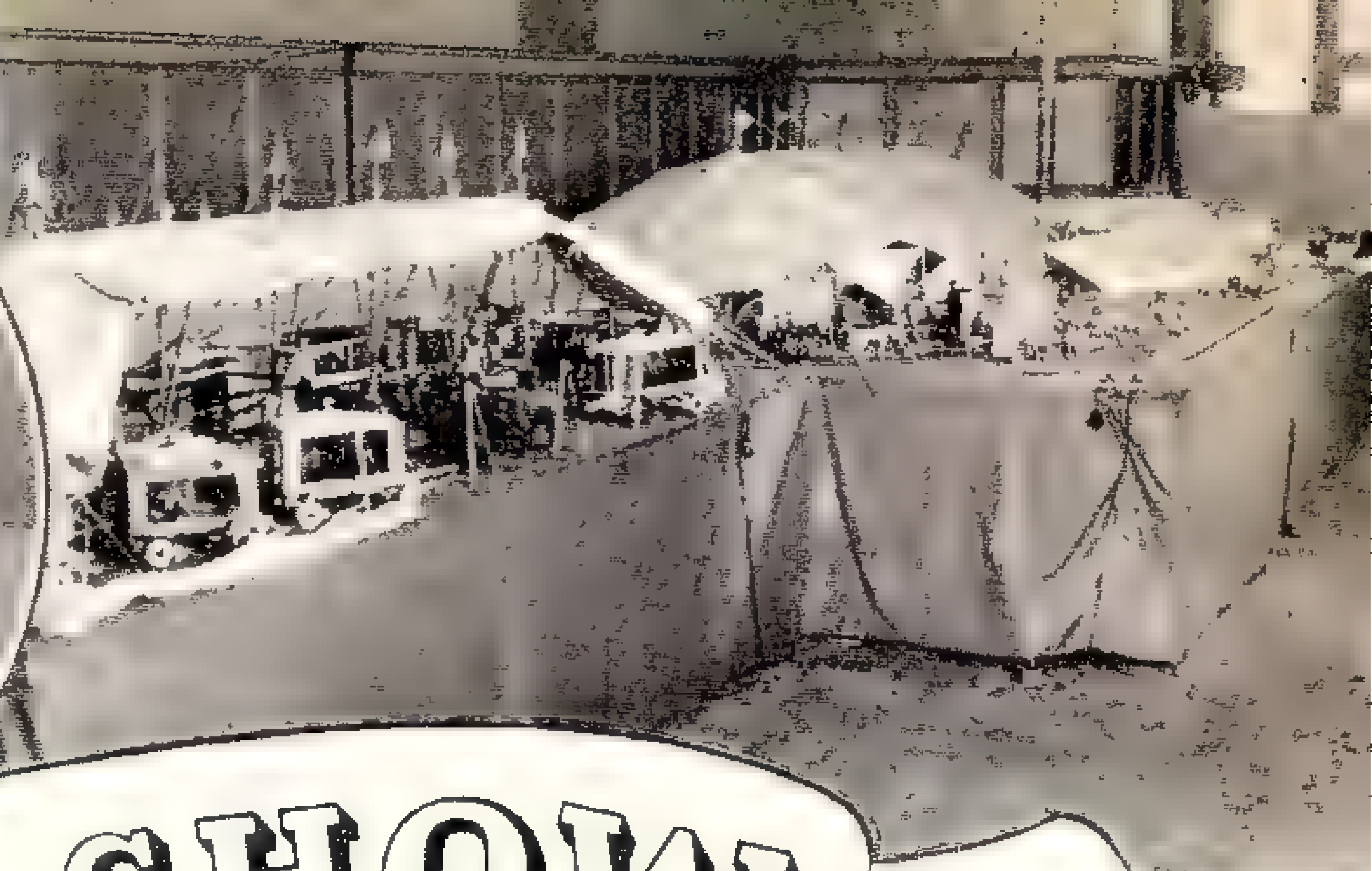
by
Robert M. Hyatt



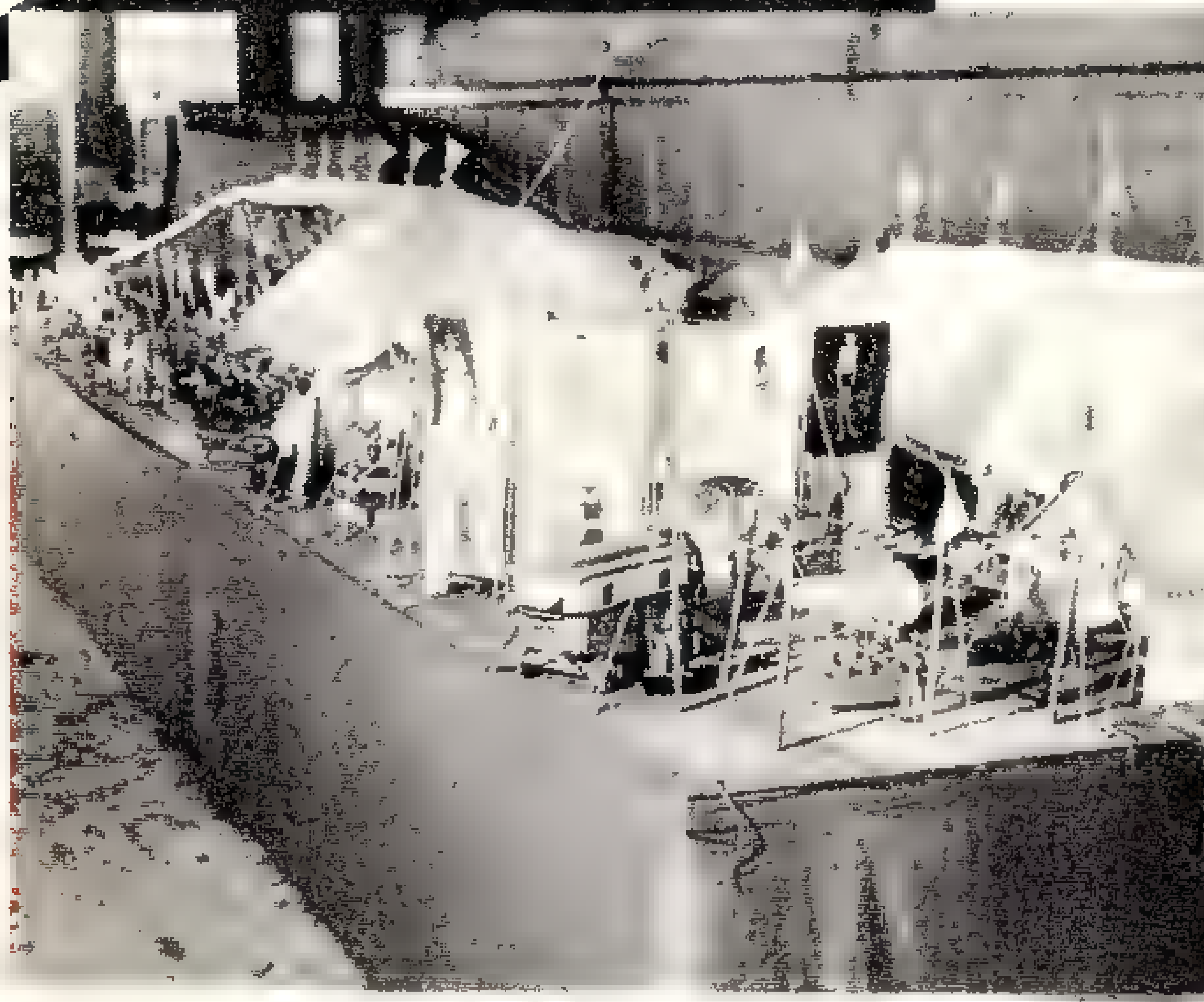
Shown above is a section of the interior of the Parke Miniature Circus. Rings and stages are only 14 inches in diameter or square.

Clyde W. Parke, of Memphis, Tenn. (right), whose skill as a whittler enabled him to create his famous miniature circus.





Circle, above—One of the tiny show's floats—a Far Eastern Empress carried by slaves. Above—The menagerie tent with its animal wagons. The "Big Top" is shown in background of photo.



A view of the side show entrance to the miniature circus is shown above. Note the ticket wagon and ballyhoo posters. Right—A comic police patrol wagon exhibit.

FOR years, Clyde W. Parke, of Memphis, Tennessee, had been hearing the jibes and laughter of his friends as they watched him toil away with penknife and scraps of lumber. For years he had given them the same friendly smile and the same good-natured answer:

"You'll see. One of these days I'll have the greatest circus in the world!"

It wasn't a facetious remark; it was a prophesy. For today Mr. Parke is the owner of the world's most intriguing miniature circus. He is a modern Jonathan Swift, but on a more magnificent scale. Both creators of Lilliput, Mr. Parke differs from his ancient contemporary in that the creatures of his vivid imagination manifest themselves in Pigmy figures carved in wood, instead of fictionized characters.

For thirteen years, beginning at the age of 37, this versatile "Master Whittler" has whittled, scraped and gouged at bits of wood. He has accomplished a gigantic feat. His "show" is not a mere collection of carved wooden "people." The Parke Miniature Circus is a vast congress of more than 300 animated lifelike actors and animals, each of which *does* something different. Every thrilling stunt you have seen pulled off by daring performers in the big shows is faithfully duplicated by Parke's mechanical midgets, which are whittled to the scale of one inch to the foot. The Big Top is replete with thrills galore. There are—but wait. The best way to see a circus is to go. So step up, folks, and join the long line of eager fans buying tickets at the bright little wagon.

We have taken (in imagination) a turn about the "grounds," which are all of twenty feet long. We have had our curiosity accelerated by the antics of Firenza the Fire Eater, Stiletto the Knife Thrower, and JoJo the Dog-faced Boy. We have heard (in imagination) the husky bellowing of the barkers and spielers in front of the Side Show Tent, which is a three center-pole affair, six feet long, aflutter with gay banners advertising the wonderous sights to be seen inside. We have watched, goggle-eyed, the Sword

Boasting a height of 18 inches, the giraffe realistically looks over the top of his cage.

Swallower gulp a wicked looking blade; the Magician produce a squirming rabbit from nowhere; the Fan Dancer in seductive wiggles; and the Snake Charmer slithering amongst her venomous charges.

With bursting curiosity we line up to get inside. With the big show coming off in a few minutes, we cannot spend much time in the Side Show. After taking in the lesser spectacles here displayed, we move toward the Big Top. First, however, we must stroll through the Menagerie Tent. This is eleven by three feet in size. Around the sides are the animal cages. The center is roped off for the elephants, zebras, camels, and other large grass eaters. There is a plentiful sprinkling of straw on the floor, and here and there a tiny bale of hay. At one side of the arena a long, spotted neck topped by an ungainly head, rises above the high fence. It is the Giraffe and apparently all is well up aloft!

The Main Show Tent merits some description. On each side is the Reserve Seat section—eight sections of 80 seats each, with foot boards and backs. The spectators seated here are cooled by 16 midget electric fans.

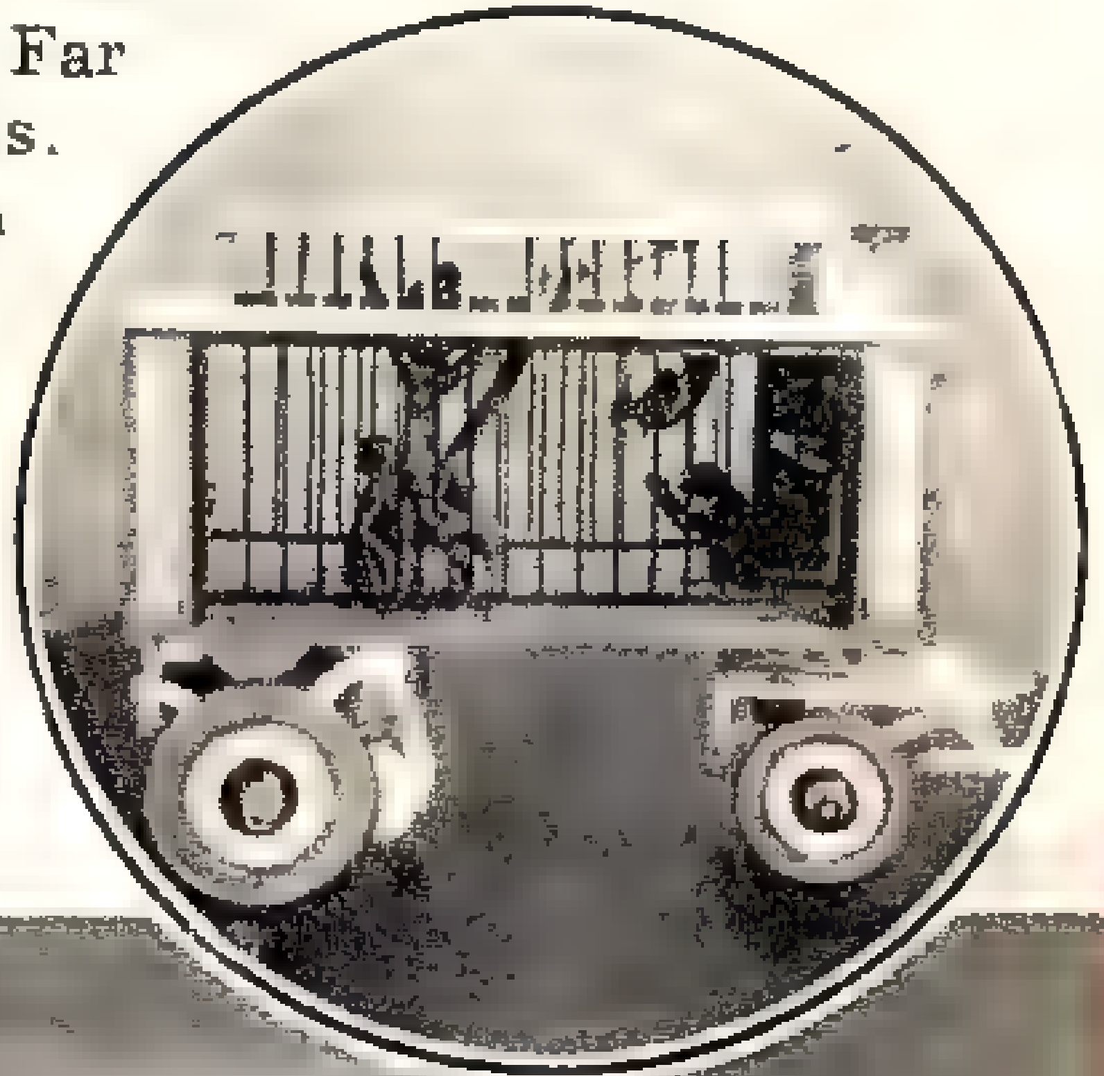
At last seated (figuratively), we glance around the sparkling interior. Countless tiny ropes hold up, with the aid of block and tackle, the pole assembly of the entire tent. Our eyes are dazzled by the clusters of lights around each pole. There is the trapeze rigging, the aerial wheels, and all the paraphernalia used by the little actors. But we are not given long to indulge in these commonplace essentials. With a mighty flourish the Grand Parade enters the arena at one end of the Reserve Seat section, and all eyes focus upon this colorful display.

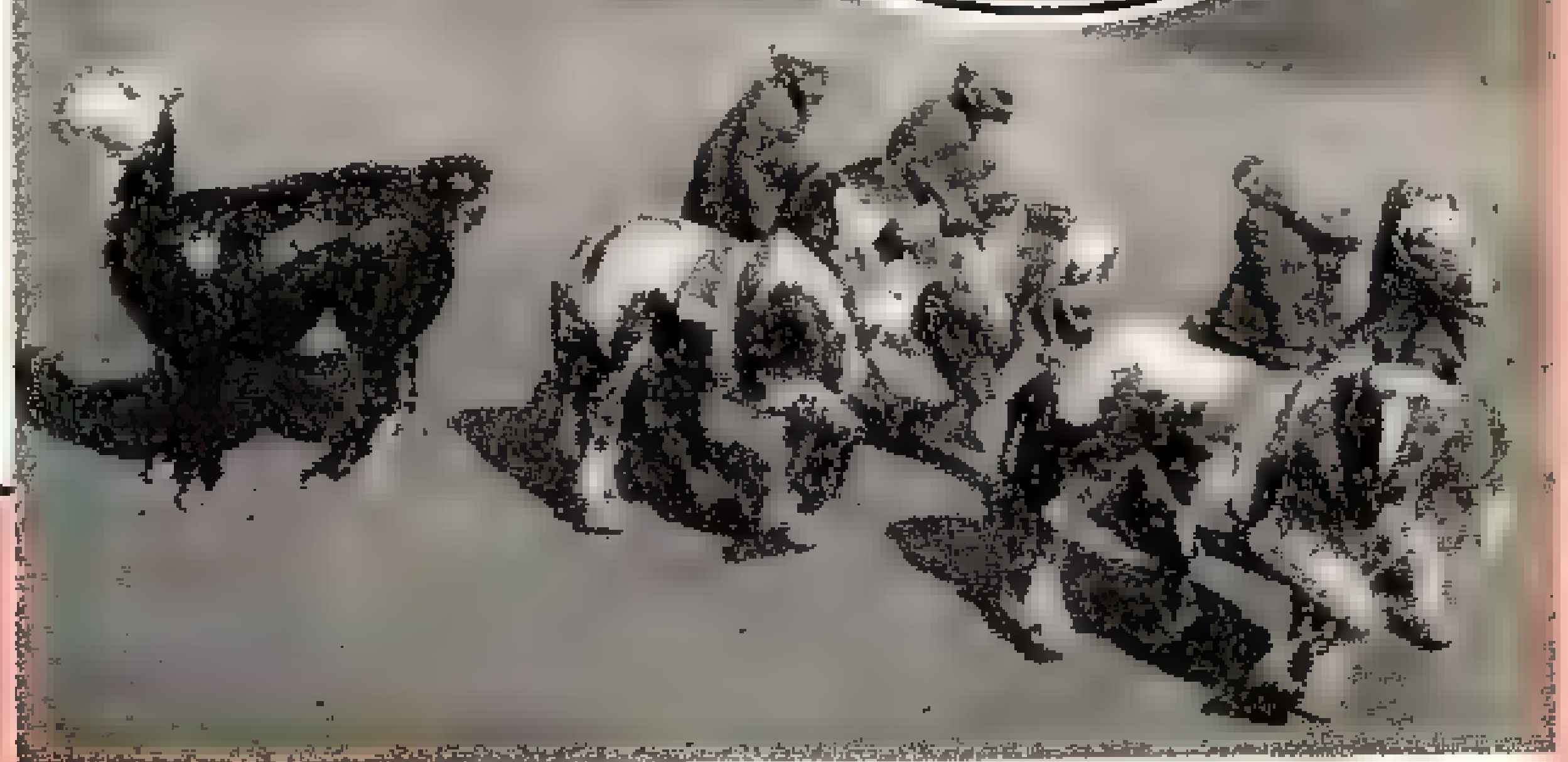
First into view comes six prancing white horses, drawing the band wagon resplendent in red, white, black and gold colors. The spirited, high-stepping chargers give us as much thrill as does the driver on the seat, swinging his reins and swaying his body to the mythical rhythm of the five-man orchestra behind him.

Immediately following this appears several floats. There is "Little Red Riding Hood," "Peter Pumpkin Eater" and the "Old Woman in the Shoe" with all her brood. Then the most dazzling of all the floats—Queen of Sheba, seated on her gaudy throne, surrounded by realistic fire urns, and haughtily gazing out over the backs of her six white horses. On either side and behind her stand servants dressed in white, each waving a palm fan over Her Majesty.

Still another float is that of some Far Eastern empress. She is seated on an ornate palanquin borne on the backs of six stalwart Nubian slaves. At her feet crouches a snarling tigress.

The Monkey Wagon (right) is a big favorite with spectators at the midget circus. The monkeys, skillfully carved, are shown in typical simian antics.





A llama and monkeys riding horseback are featured in this group of midget circus animals. All are carved from wood

Eight life-like horses draw the gayly colored Band Wagon, with its rhythm-swaying musicians, as it enters the arena at the head of Grand Parade (right).

There follows the yellow and white wagon bearing a huge hippopotamus. He seems quite content even in his cramped quarters, since the bed of the wagon is composed of a tank of water (a glass top creating this illusion) where Mr. Hippo may take a dip.

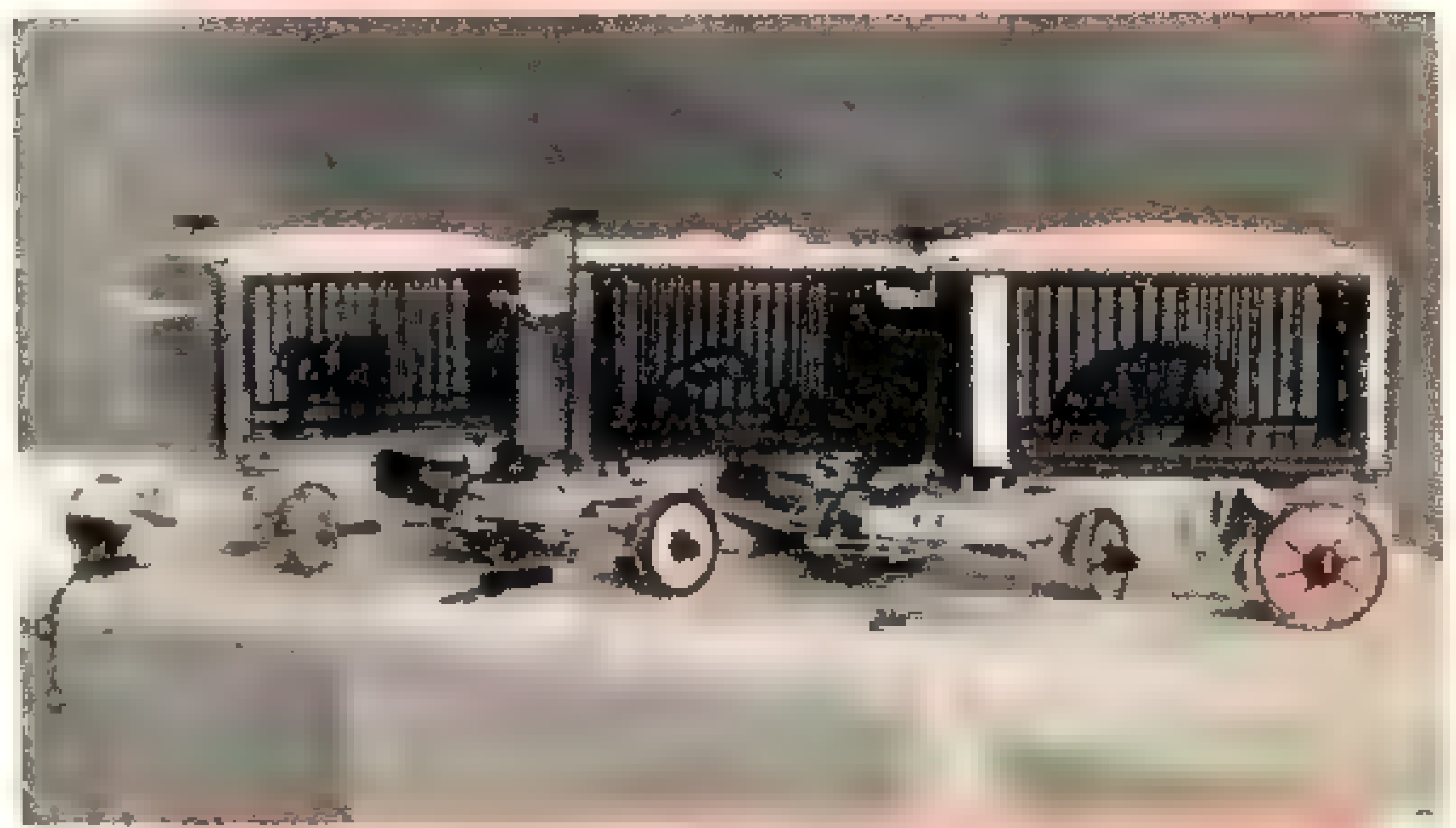
The Monkey Wagon causes a howl of applause. Here several of the amusing little simians disport themselves in all the tricks known to Monkeydom.

The next wagon might have arrived from Greenland. Giant icicles hang down over an icy blue background, while the roof is a replica of the flashing Aurora Borealis. Within, reclining in his proper environment of gleaming snow and icebergs, is a giant polar bear.

There is a wagon of serpents and so realistic are they that many in the audience refuse to touch even the wagon! Following this are the gorgeously bedecked wagons with lions, leopards, kangaroos, gnus, a tank of seals, black bears, and many other animals. There is a ponderous rhinoceros, one of the rarest beasts in captivity, and several gangling giraffes. Mr. Parke here calls our attention to something that may surprise many of us: The giraffe's tremendously long front legs are in reality no longer than his seemingly shorter hind ones. It is only because his shoulders are so high, causing his back to slant at a grotesque angle, that his front legs appear longer.

[*Continued on page* 118]

Majestically, two lions (above) survey spectators from their cage. Note the oil can atop one wagon.



Above—Three of the unusually detailed menagerie circus wagons.

Realistic enough to cause spectators to shiver is the miniature Serpent Wagon exhibit, shown above.

Even a Lilliputian circus must have a feeding time for its animals, as shown in the photo above where elephants, zebras and a camel tackle some strewn hay. Right—A polar bear nervously paces his wagon cage as part of the "biggest little show" routine performance.

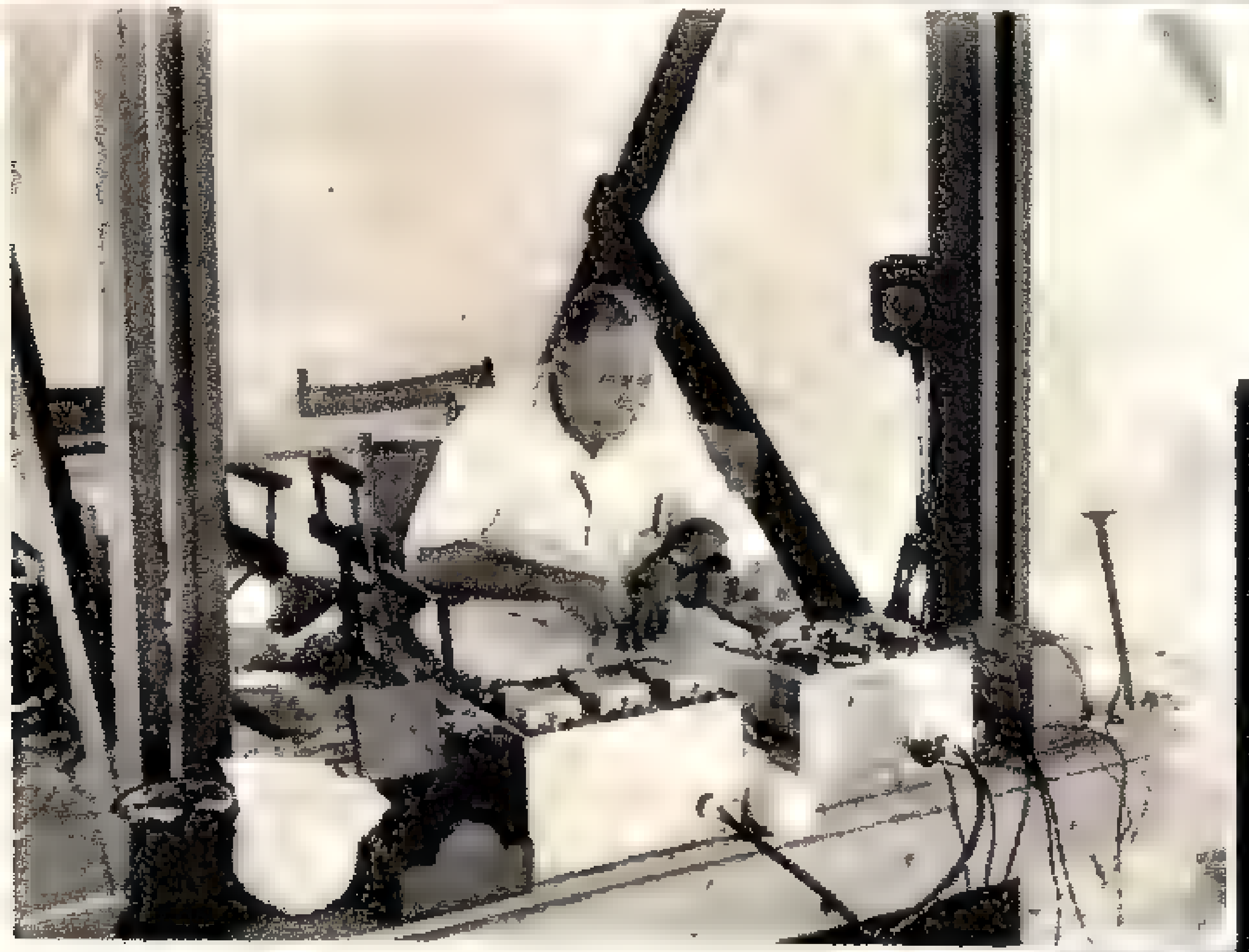
STOP
NEXT LAP
2000 MI

The MEN Behind the STOP WATCH

by
Maxwell Reid Grant

Error is reduced to a minimum by having electrically controlled devices do all the measuring. The instruments are watched constantly by officials.

Official records require strict adherence to rules under supervision of the A.A.A.



Top—Muroc Lake is the scene of many gruelling car tests and new records. Above left—Electrical timers keep an accurate check and furnish indisputable evidence of records. When endurance tests are being conducted, flares light the course during the night. Hour after hour, cars speed around the course while A.A.A. officials watch every detail of the test.

ROARING around an outlaw track in a warm-up lap, a racing driver noticed one of his front wheels wobbled dangerously. Quickly he pulled into the pit, where mechanics found a front spindle broken. It was too late to change before the race.

A few minutes later the car rolled across the starting line with the spindle welded. As the driver streaked around the course on the third lap, the welded spindle suddenly parted. His car left the track, rolling over and over. The unfortunate driver was picked out from a pile of smoking, twisted wreckage.

Such an accident under American Automobile Association control would never have happened, as the car would not have been allowed to start. Power to bar an unsafe car from the track belongs to a little group of technical experts who hold in their hands the lives and reputations of drivers upon the nation's major speedways. That's why the "Three-A" contest board is the supreme court of the racing world, and why its decisions are final.

Perhaps you have seen the yellow flag suddenly raised during an exciting contest. An A.A.A. man has noticed some unforeseen danger on the track, and drivers are warned to hold their relative positions until the green flag tells them of hazards cleared. Then they must make a complete lap before applying a heavy foot to the accelerator. Just a short time ago, for example, a racing car broke an oil line, spilling oil on the track. Up went the yellow flag. All drivers eased their throttles until the green flag was raised to show the track clear.

Here is a battery of electrically controlled stop watches. Large charts are kept and every lap accurately recorded. Every possible precaution is taken to prevent slightest error in records.

Long before the crowd fills the grandstand, A.A.A. men have been busy behind scenes. Cars have been inspected and then impounded to await the starting signal. All are thoroughly examined for safety, especially front axles and steering mechanisms. Specified devices such as safety arms to prevent losing of wheels, and a fire dash between driver and engine compartment, must be carried. If a car is too light for good driving, the driver may not "slug" his mount by carrying sand-bags or other weight, unless it is built into the car. The hood must be fastened securely with two straps over it. If a driver loses it during a race, he must retrieve it next lap.

The A.A.A. is the American branch of the parent association, the Internationale des Automobile-Clubs Reconnus. Racing clubs register as members, accepting its authority to rule on all mechanical phases of their contests. Disputes between drivers come before this court of the track for settlement. Sometimes one racing pilot will accuse another of forcing him into a spin by crowding. A committee hears the complaint, and if it cannot settle it, refers it to the national committee, which meets four times yearly in Washington.

Six times in eight main-event races, a cer-

TUNING UP THE OUTBOARD MOTOR

Ardent fishing enthusiasts are "boosters" of the outboard engine because it enables them to visit widely separated fishing grounds within minimum time.

IF YOU, like thousands of other sensible outboard motor owners, stored your motor away last winter in accordance with the clearly printed instructions that were supplied with the engine at the time of its original purchase you need only observe a few simple, common sense "tuning up" rules *now* in order to insure maximum efficiency throughout the dawning boating season.

The first step is to go over the entire motor, tightening all screws and nuts. If a screw does not seat properly, do not force it, but unscrew it. Then, after dipping the screw in some heavy oil, try rescrewing again, making sure that you have engaged the threads properly.

Remove the spark plugs and squirt some clean gasoline into the spark plug holes. Pull the motor over by means of the starter rope until the oil that was placed in the cylinders during the winter has been pretty well removed.

Check the spark plugs for breakage and adjust the gaps according to the manufacturer's specifications. Test the plugs to see if they are delivering a good spark by attaching each plug, in turn, to a spark plug wire (grounding one wire in the case of two, or more, cylinder types) and turning over the engine to see if a "hot" spark appears across the plug points.

In the event you do not get a good spark, remove the entire magneto assembly and check all wires for breakage. The coil can be given a protective coating of water-proof varnish at the same time.

Take the carburetor apart, as explained in the manufacturer's instruction booklet (if you lost yours, you can obtain a new one from the manufacturer at a nominal cost), and remove all dirt and oil.

Replace the gasket if necessary, as indicated by breakage or a dried out appearance.

Clean out all old grease from the gear housing, wash the housing in gasoline and check the gears for breakage. Refill the housing with grease recommended by the manufacturer. (This is probably the most important of all pre-season precautions).

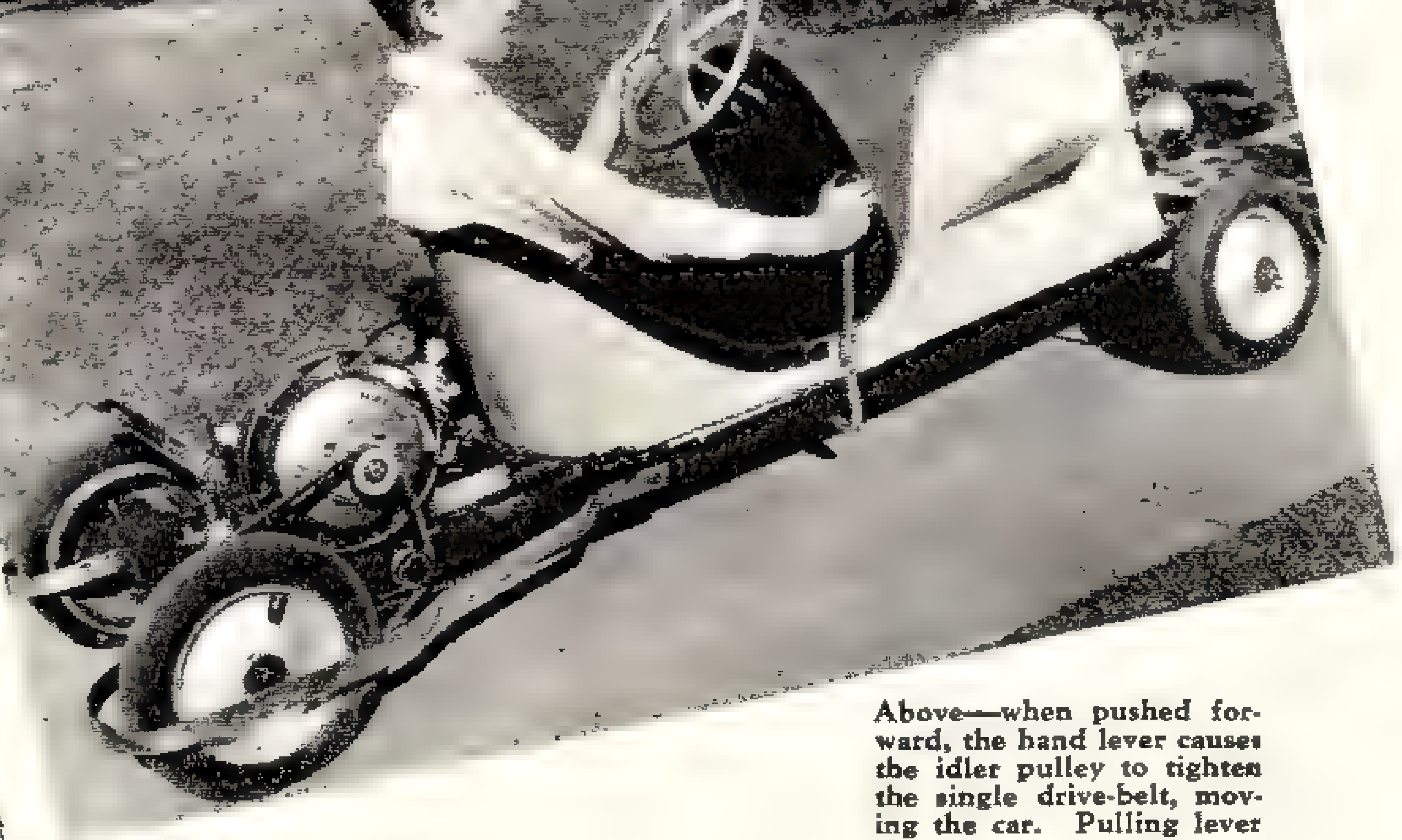
Having tightened all screws and nuts, checked the plugs, magneto, coil, etc., as well as cleaned the carburetor and refilled the gear housing, you are ready to mount the motor on your boat.

Start the engine in the usual manner, making certain that water is running through the pump within a few seconds or the cylinders will crack from the heat. Carefully adjust the carburetor until you are getting maximum efficiency and smooth running. Don't "go off the handle" if the engine does not run smoothly at first, but check over all parts systematically until you locate the trouble. "Losing your head" won't get one single r.p.m. out of the engine. Modern outboards are practically fool-proof and when they do break down it can usually be traced to abuse by the operator.

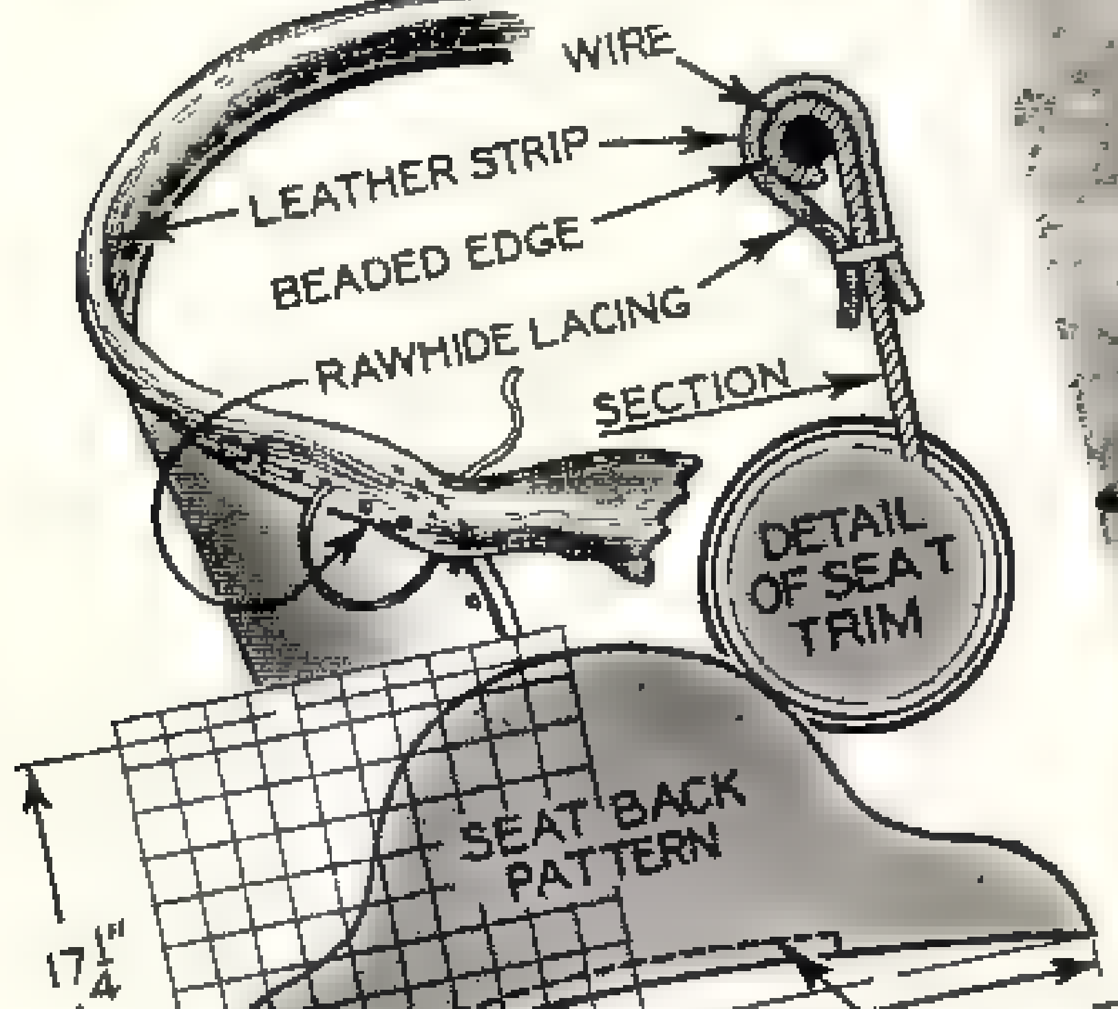
The knowledge that the outboard motor will eliminate the tiring job of rowing back to camp helps to make the fisherman's day more enjoyable (top) and enables the followers of Izaak Walton to linger at the choice spots until the last possible moment without fear of missing "chow." Above—Hunters, too, find the outboard to their liking for there is nothing like the powerful "putt-putts" when it comes to traveling upstream in a boat loaded with hunting and camping equipment.

This SIDEWALK RUNABOUT is Easy to Build

Head on, the "Weber Roadster" has a striking appearance. In the drawings below, the construction details of a simpler radiator and hood are shown.



Above—when pushed forward, the hand lever causes the idler pulley to tighten the single drive-belt, moving the car. Pulling lever back applies the brakes.


WIRE
LEATHER STRIP
BEADED EDGE
RAWHIDE LACING
SECTION
DETAIL OF SEAT TRIM
17¼"
SEAT BACK PATTERN
40"
CUT OUT TO FIT BETWEEN FRAME SILLS

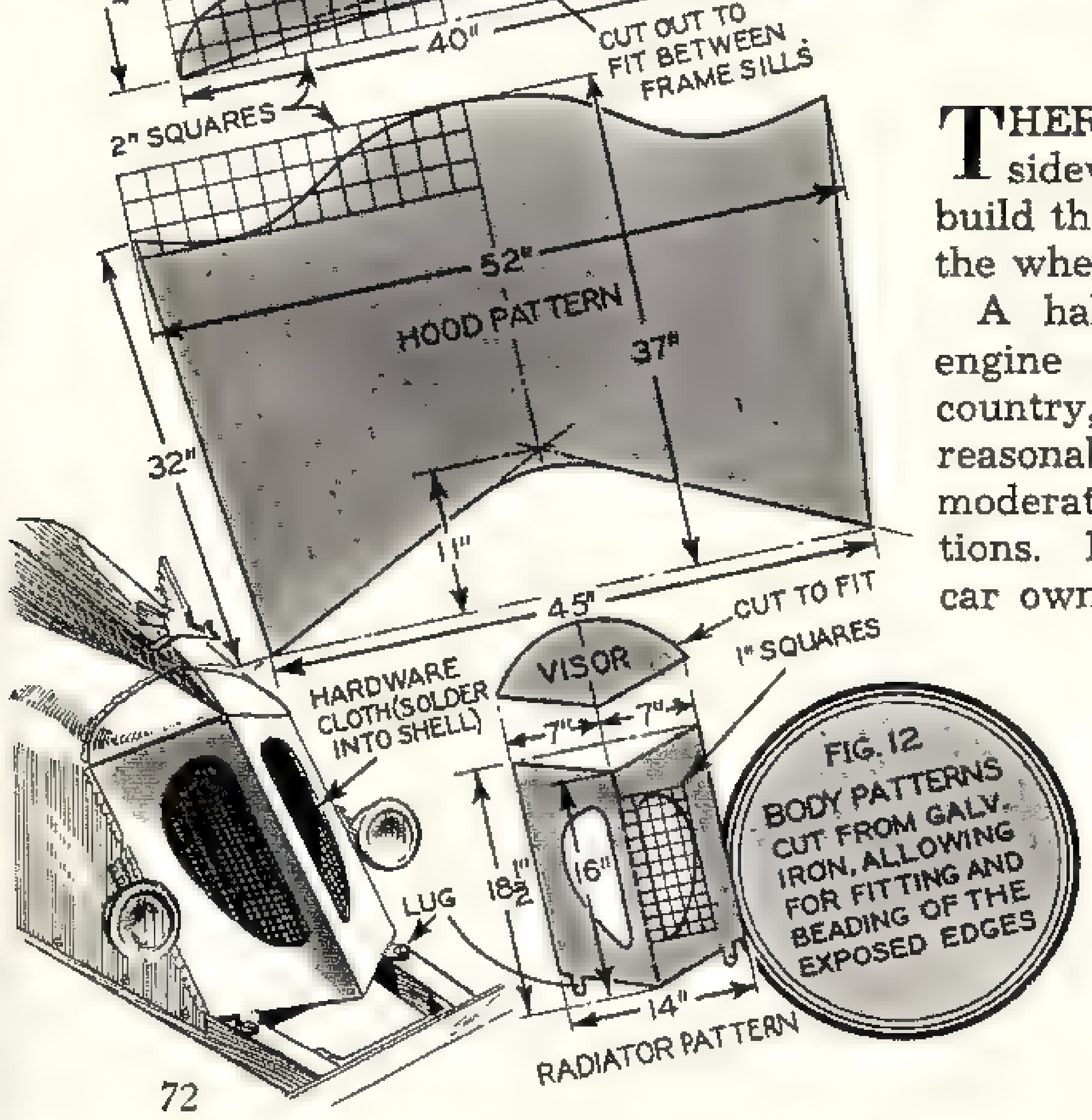

2" SQUARES
52"
HOOD PATTERN
37"
32"
11"
45"
CUT TO FIT
VISOR
1" SQUARES
HARDWARE CLOTH (SOLDER INTO SHELL)
7"
7"
16"
18½"
LUG
14"
RADIATOR PATTERN

FIG. 12 BODY PATTERNS CUT FROM GALV. IRON, ALLOWING FOR FITTING AND BEADING OF THE EXPOSED EDGES

by Hi Sibley

THERE is one definite rule to follow in making a sidewalk automobile—get your engine first and build the car around it. This applies pretty much to the wheels, too.

A half-horsepower, two-cycle washing machine engine is available in nearly all sections of the country, and as these can be had second-hand at a reasonable price and have sufficient power for moderate speeds, they make satisfactory installations. Herewith are working drawings of the little car owned by Richard Weber, of San Marino, California, which is driven by this type of motor and has proved successful for a long period. It is very easy to build.

In Figs. 1, 2 and 3 are given the general over-all dimensions. Note that the front wheels have a wider tread than the rear. This permits a shorter turning radius, and brings the back wheels in close to the power unit. The engine is provided with a kick starter, and the clutch arrangement consists of an idler pulley which tightens the single drive-belt when the hand lever is pushed forward. When pulled back, it operates the brake. Drive is on one wheel, brake on two.

Hood, seat-back and dummy radiator are of galvanized iron cut as shown in Fig. 12. These dimensions are approximate as a certain amount of fitting is always necessary for curved members. If you have the facilities,

Left—The trim little runabout is powered by a washing machine motor of one-half horsepower, which enables the car to travel about 16 m.p.h., averaging 50 to 75 miles per gallon of gasoline. Motor is connected to one wheel by a drive-belt.

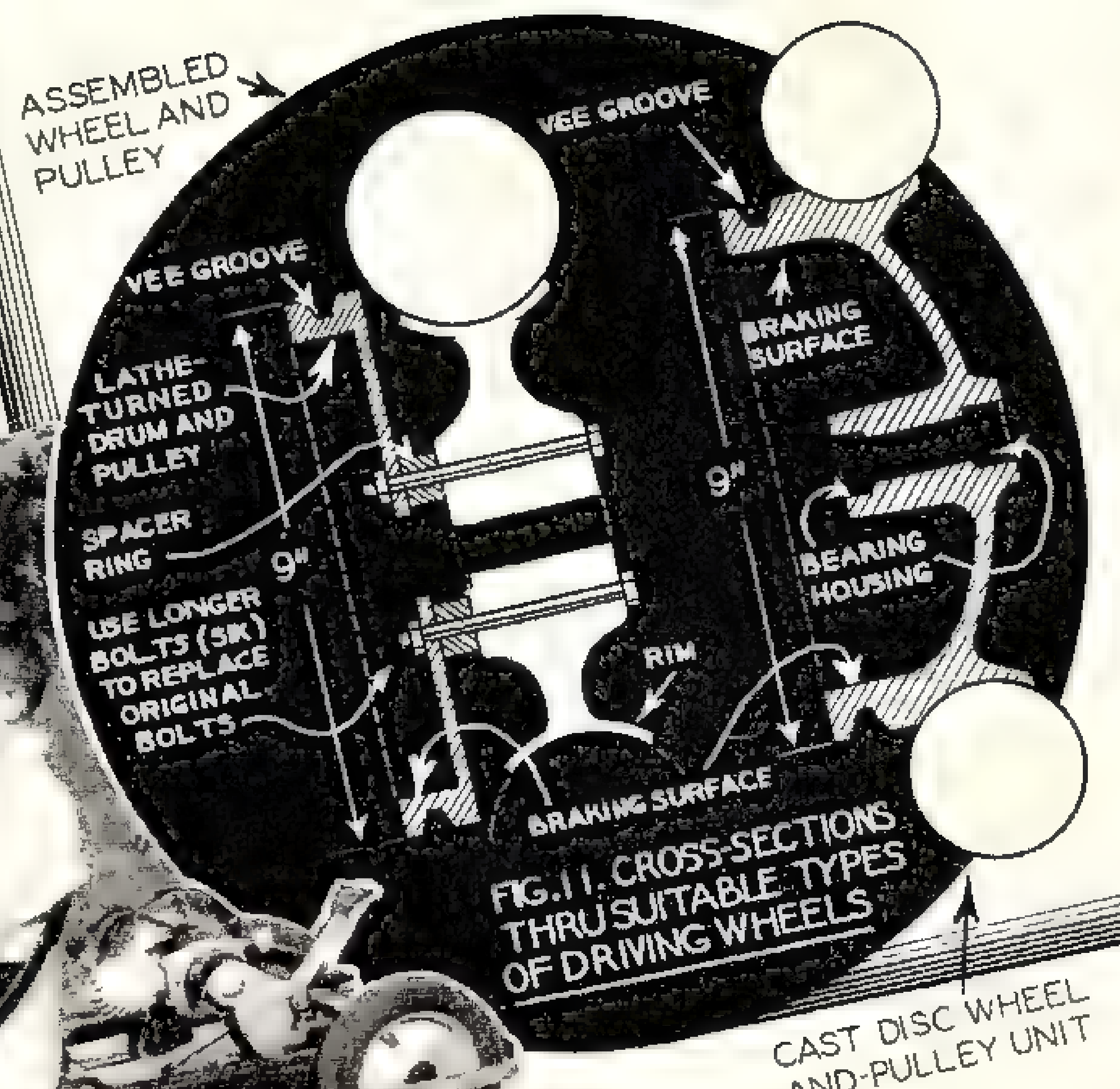
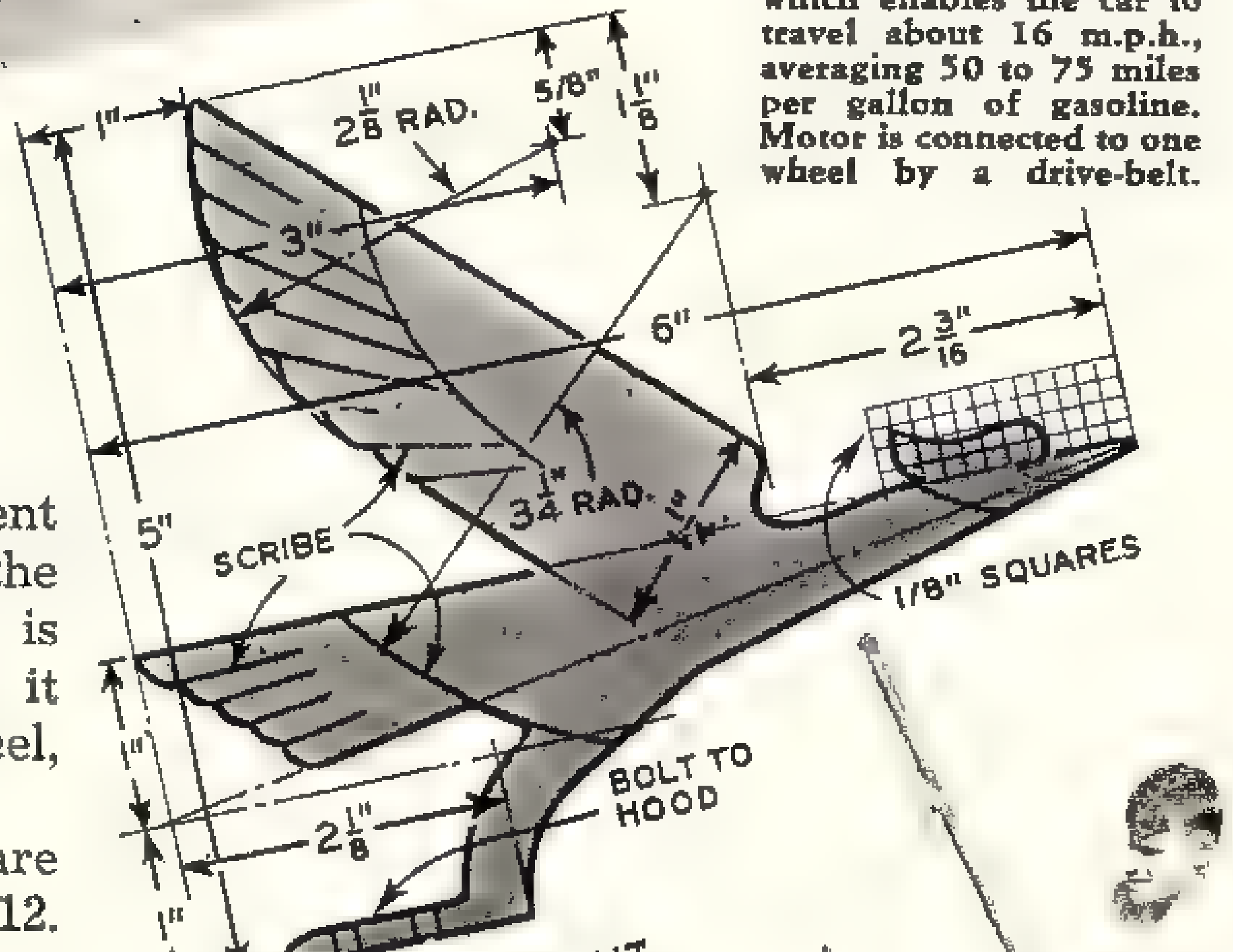
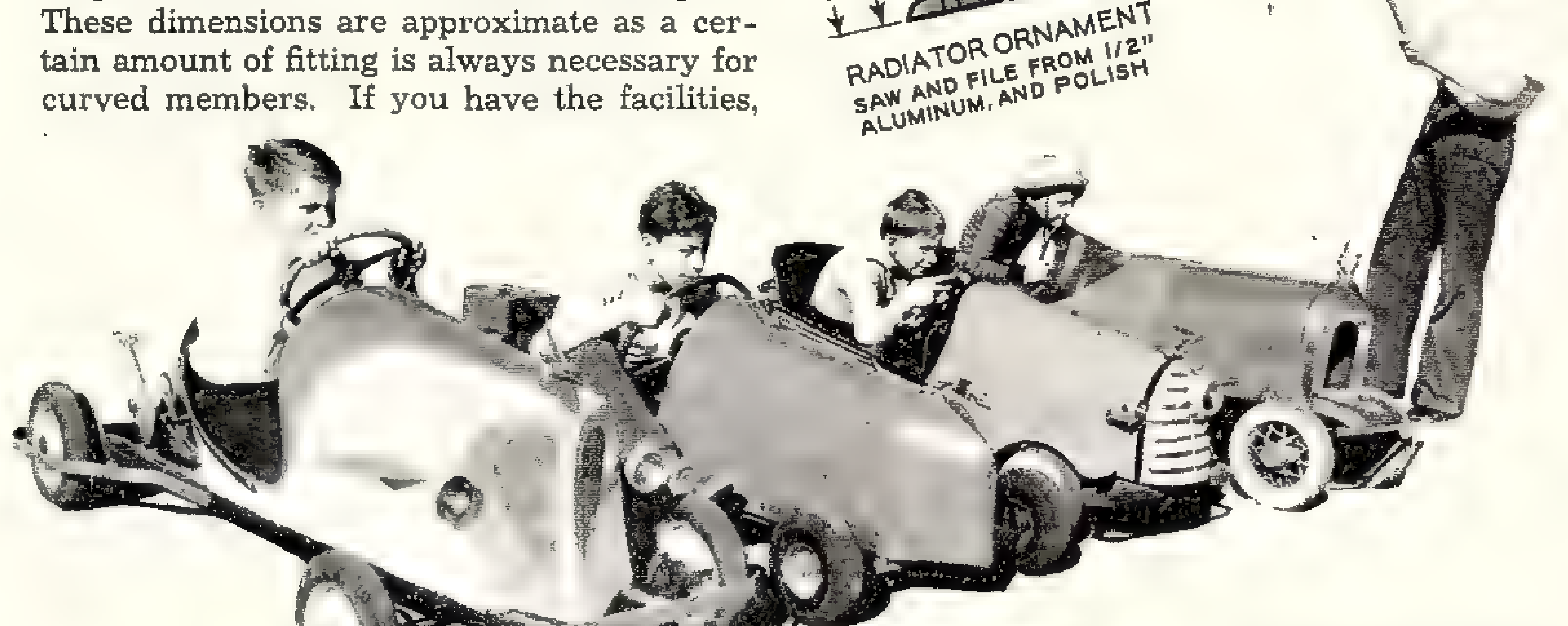

ASSEMBLED WHEEL AND PULLEY
VEE GROOVE
LATHE-TURNED DRUM AND PULLEY
SPACER RING
9"
USE LONGER BOLTS (SK) TO REPLACE ORIGINAL BOLTS
VEE GROOVE
BRAKING SURFACE
9"
BEARING HOUSING
RIM
BRAKING SURFACE
CAST DISC WHEEL AND-PULLEY UNIT

FIG. 11. CROSS-SECTIONS THRU SUITABLE TYPES OF DRIVING WHEELS


1"
2⅛" RAD.
5/8"
1⅛"
3"
6"
2 3/16"
5"
SCRIBE
3¼" RAD.
½"
1/8" SQUARES
1"
2⅛"
BOLT TO HOOD
1"

RADIATOR ORNAMENT
SAW AND FILE FROM 1/2" ALUMINUM, AND POLISH



The start of a midget auto "race", with the Weber car in foreground of the lineup.

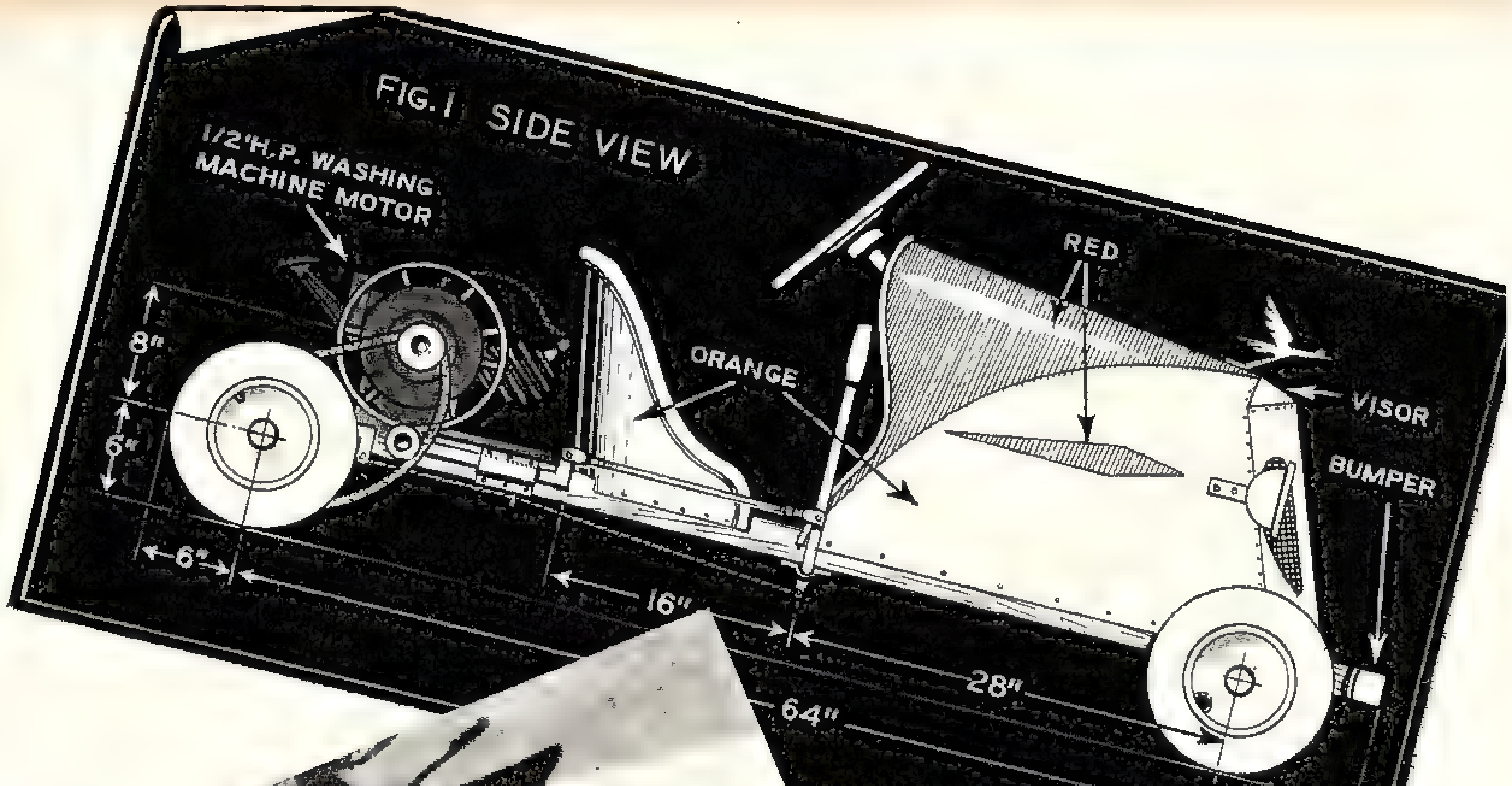


FIG. I SIDE VIEW
1/2 H.P. WASHING MACHINE MOTOR
RED
ORANGE
VISOR
BUMPER
8"
6"
6"
16"
28"
64"
9"

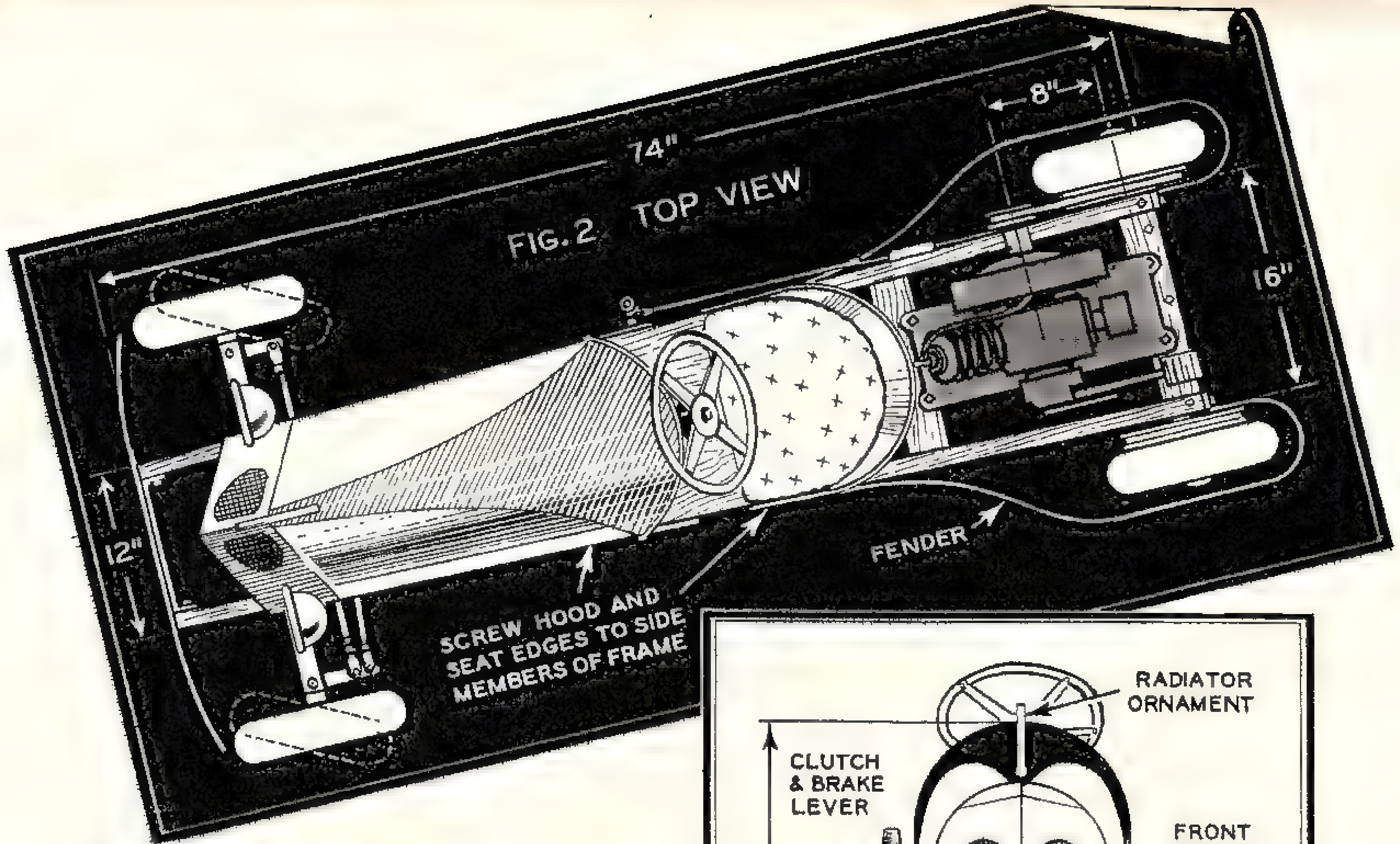
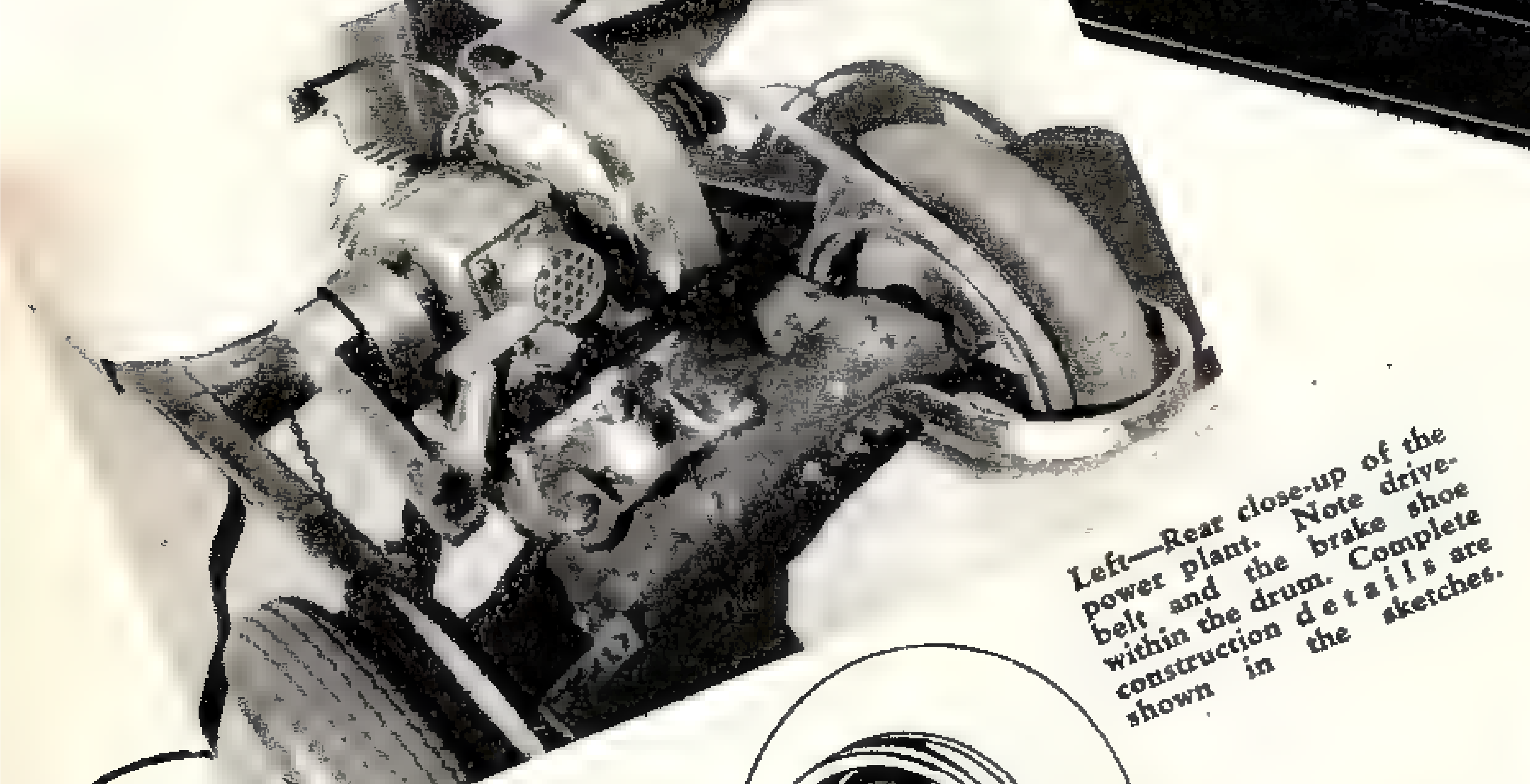
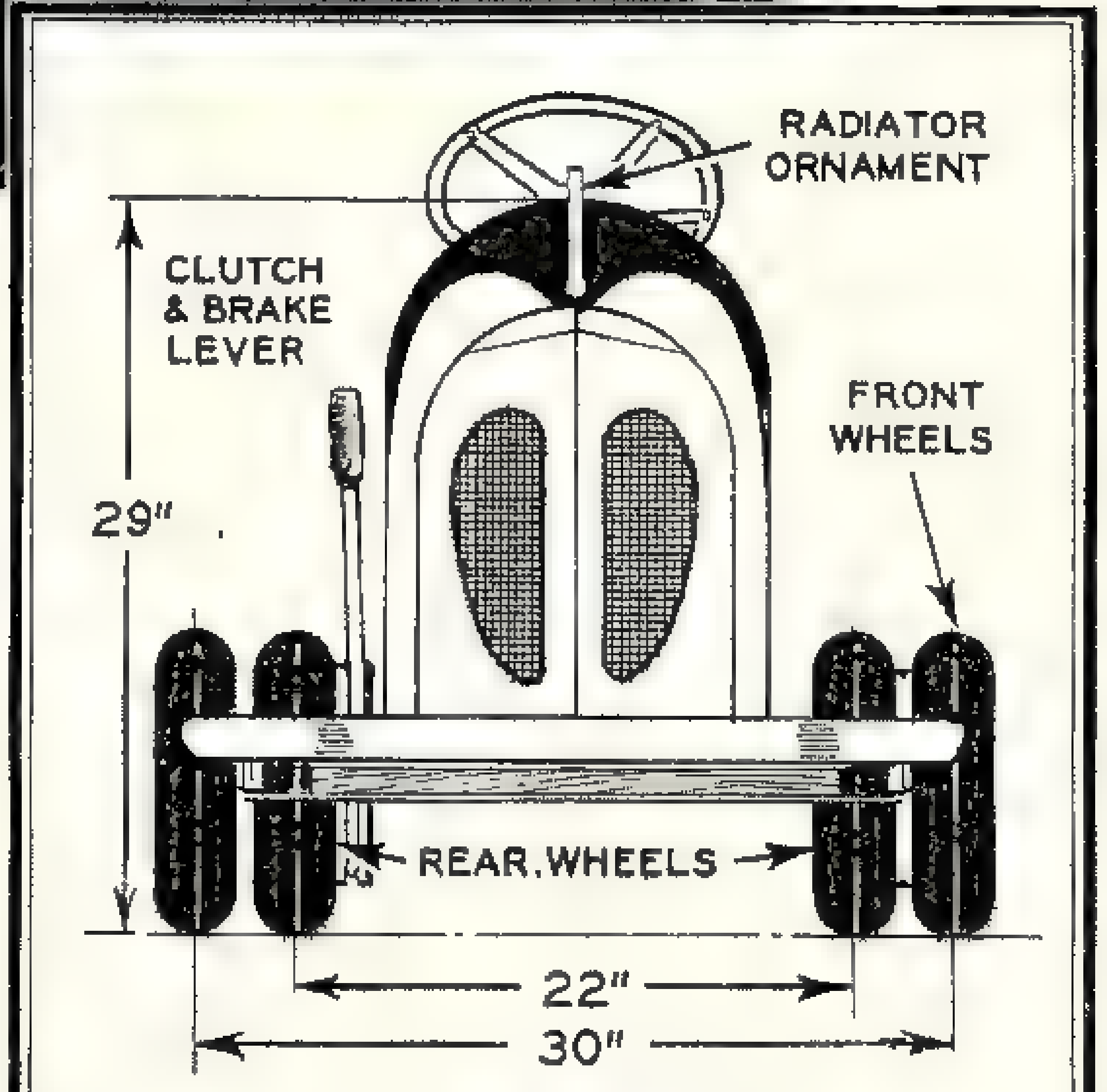


FIG. 2 TOP VIEW
74"
8"
16"
12"
SCREW HOOD AND SEAT EDGES TO SIDE MEMBERS OF FRAME
FENDER



Left—Rear close-up of the power plant. Note drive-belt and the brake shoe within the drum. Complete construction details are shown in the sketches.



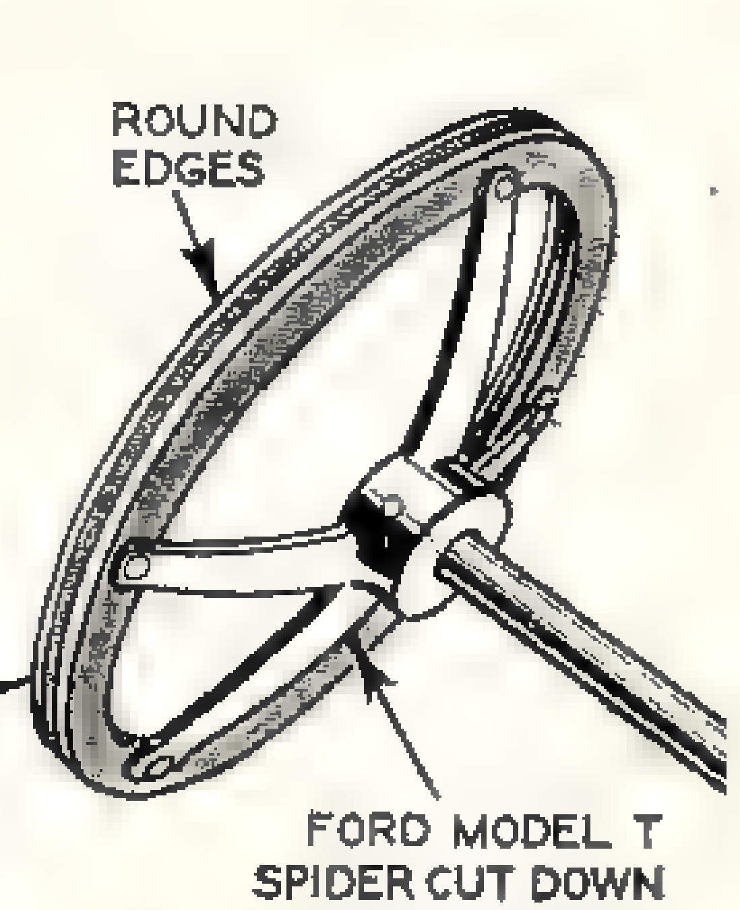
RADIATOR ORNAMENT
CLUTCH & BRAKE LEVER
FRONT WHEELS
29"
REAR WHEELS
22"
30"

FIG. 3 FRONT VIEW

the edges of the metal should be beaded. The edge of the seat back is protected with a strip of leather laced on with rawhide. It will be best to leave the cutting of the hood, etc., until the chassis is completed.

Several types of wheels are available for small autos, being manufactured by toy makers, tire companies, etc. The original car in the photos has disk wheels with the brake drum and pulley cast integral, and turned

[*Continued on page* 118]



ROUND EDGES
SAW OUT RIM FROM 3/4" PLYWOOD
FORD MODEL T SPIDER CUT DOWN TO FIT 12" WHEEL

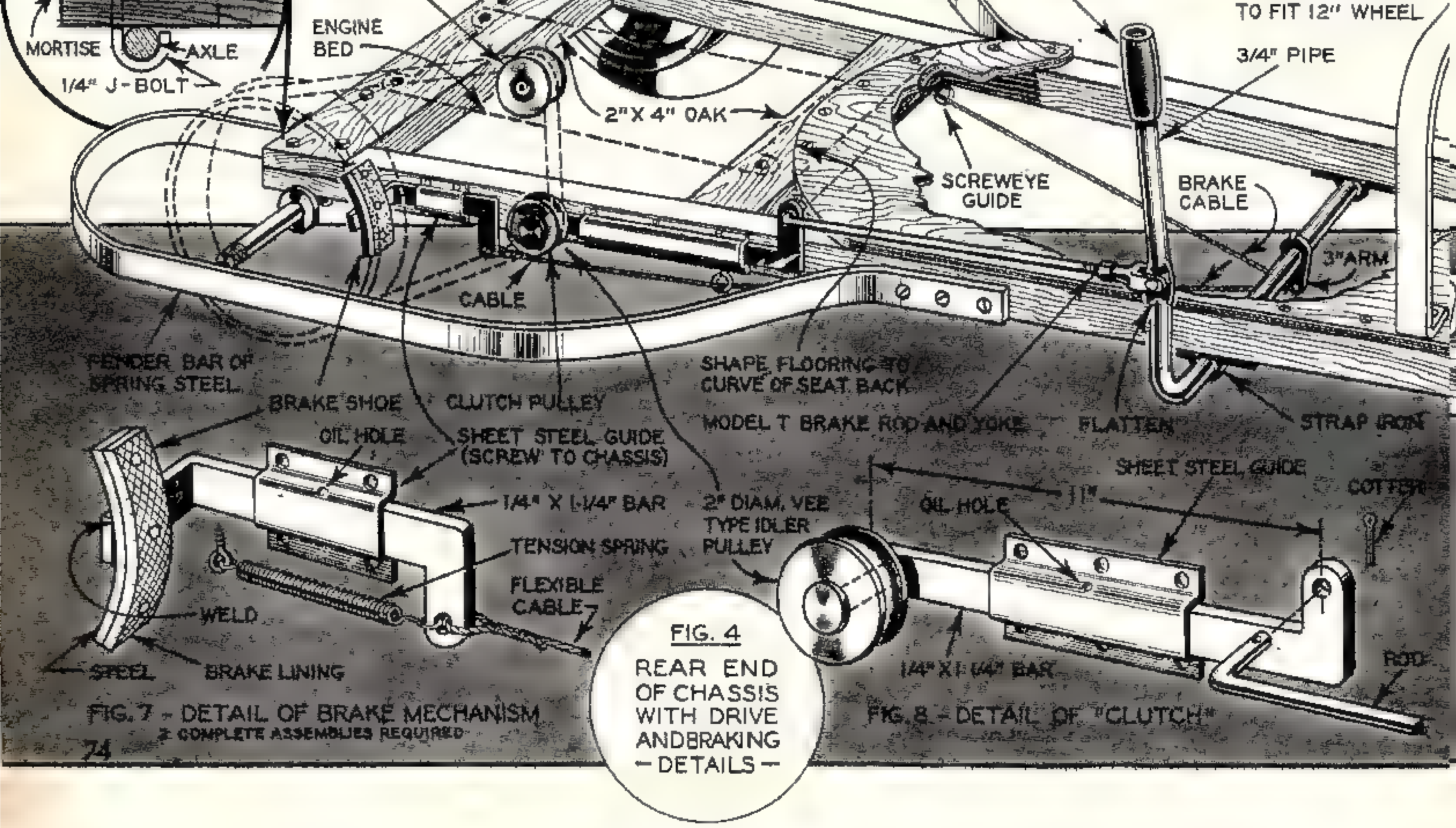
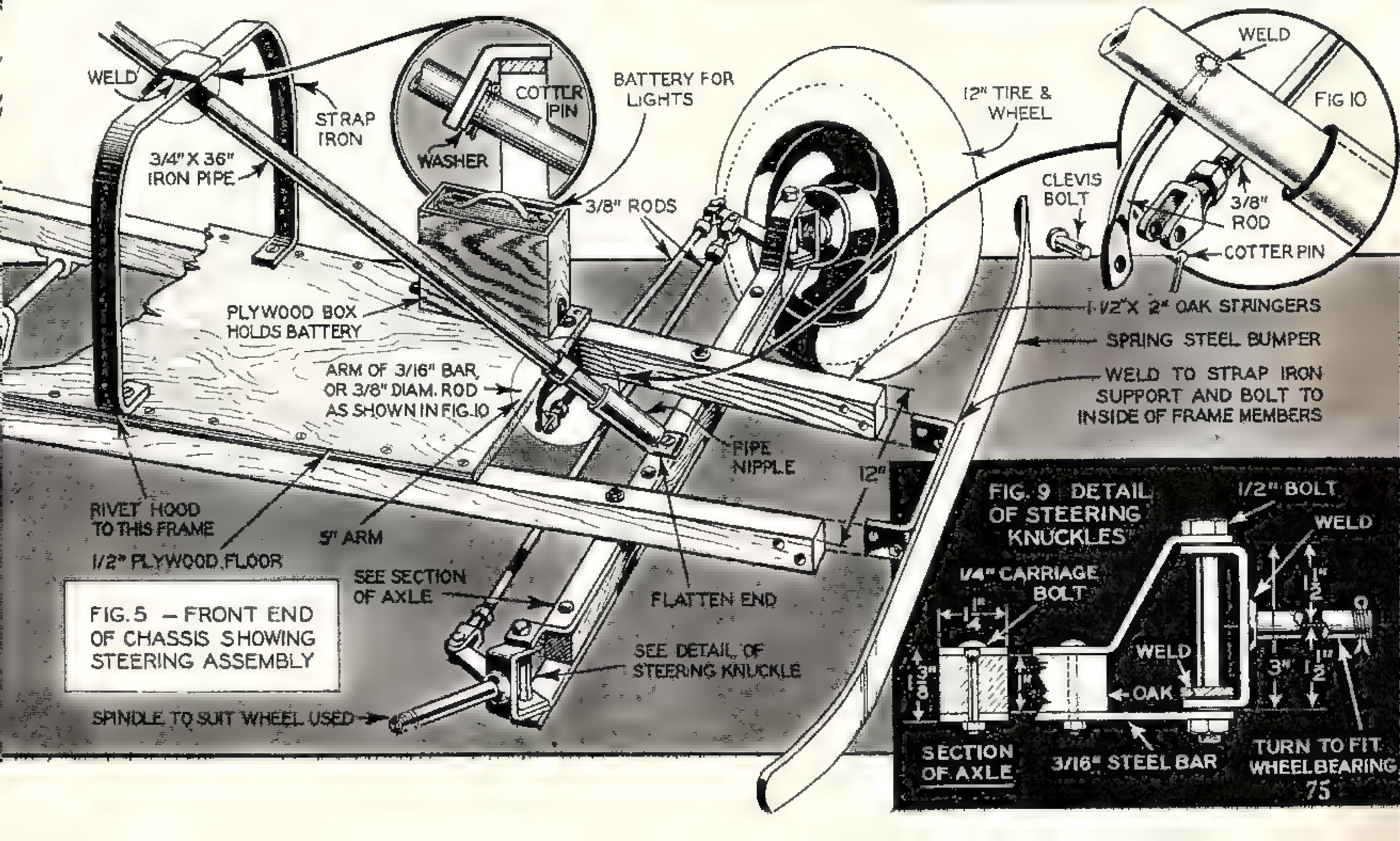


FIG. 6
MORTISE
AXLE
1/4" J-BOLT
ENGINE PULLEY
ENGINE BED
2" X 4" OAK
BIKE GRIP
3/4" PIPE
SCREWEYE GUIDE
BRAKE CABLE
3" ARM
CABLE
FENDER BAR OF SPRING STEEL
BRAKE SHOE
CLUTCH PULLEY
SHEET STEEL GUIDE (SCREW TO CHASSIS)
SHAPE FLOORING TO CURVE OF SEAT BACK
MODEL T BRAKE ROD AND YOKE
FLATTEN
STRAP IRON
OIL HOLE
1/4" X 1-1/4" BAR
TENSION SPRING
FLEXIBLE CABLE
WELD
STEEL
BRAKE LINING
2" DIAM. VEE TYPE IDLER PULLEY
OIL HOLE
11"
SHEET STEEL GUIDE
COTTER
ROD
1/4" X 1-1/4" BAR

FIG. 4
REAR END OF CHASSIS WITH DRIVE AND BRAKING DETAILS

FIG. 7 - DETAIL OF BRAKE MECHANISM
2 COMPLETE ASSEMBLIES REQUIRED

FIG. 8 - DETAIL OF "CLUTCH"

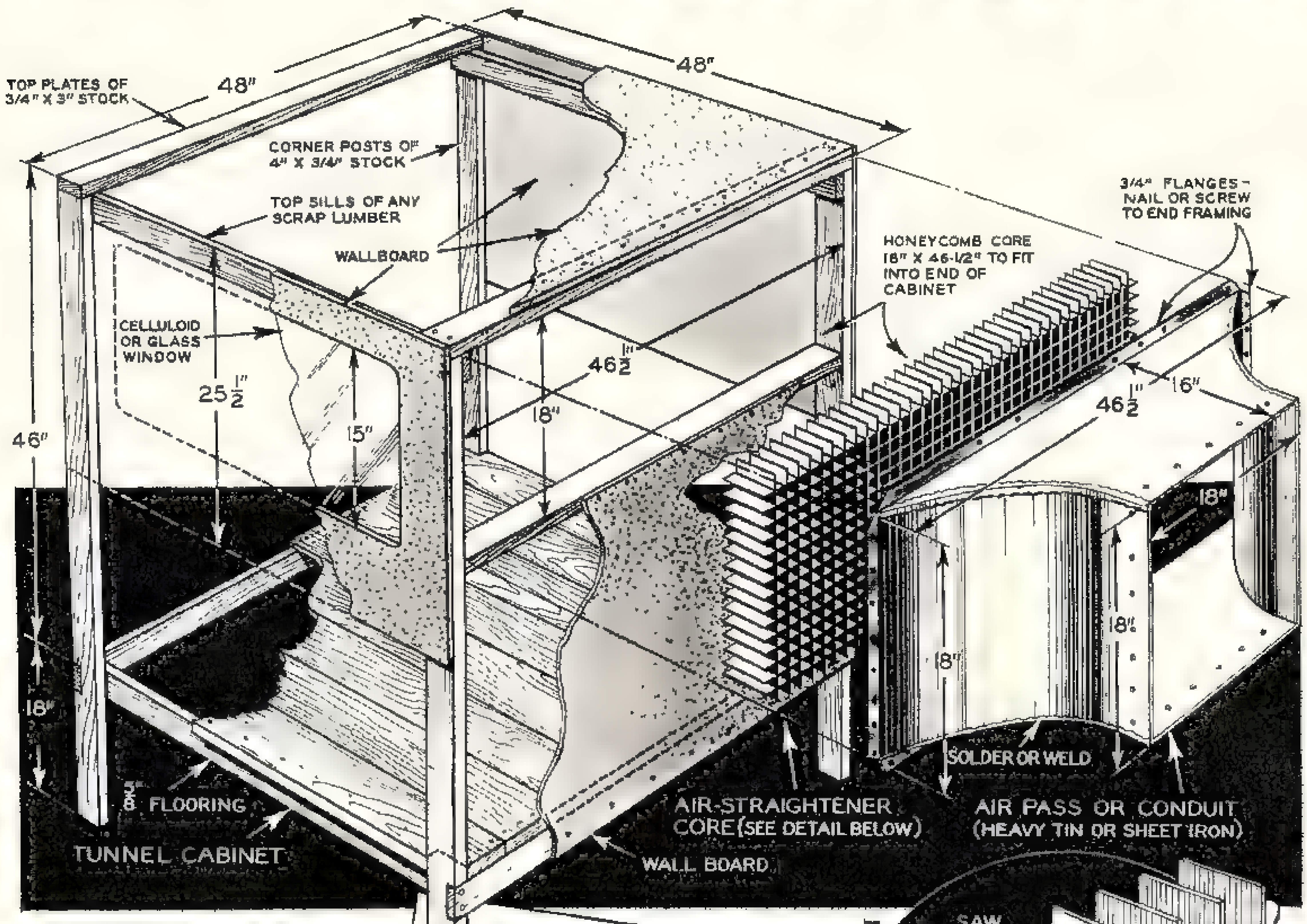


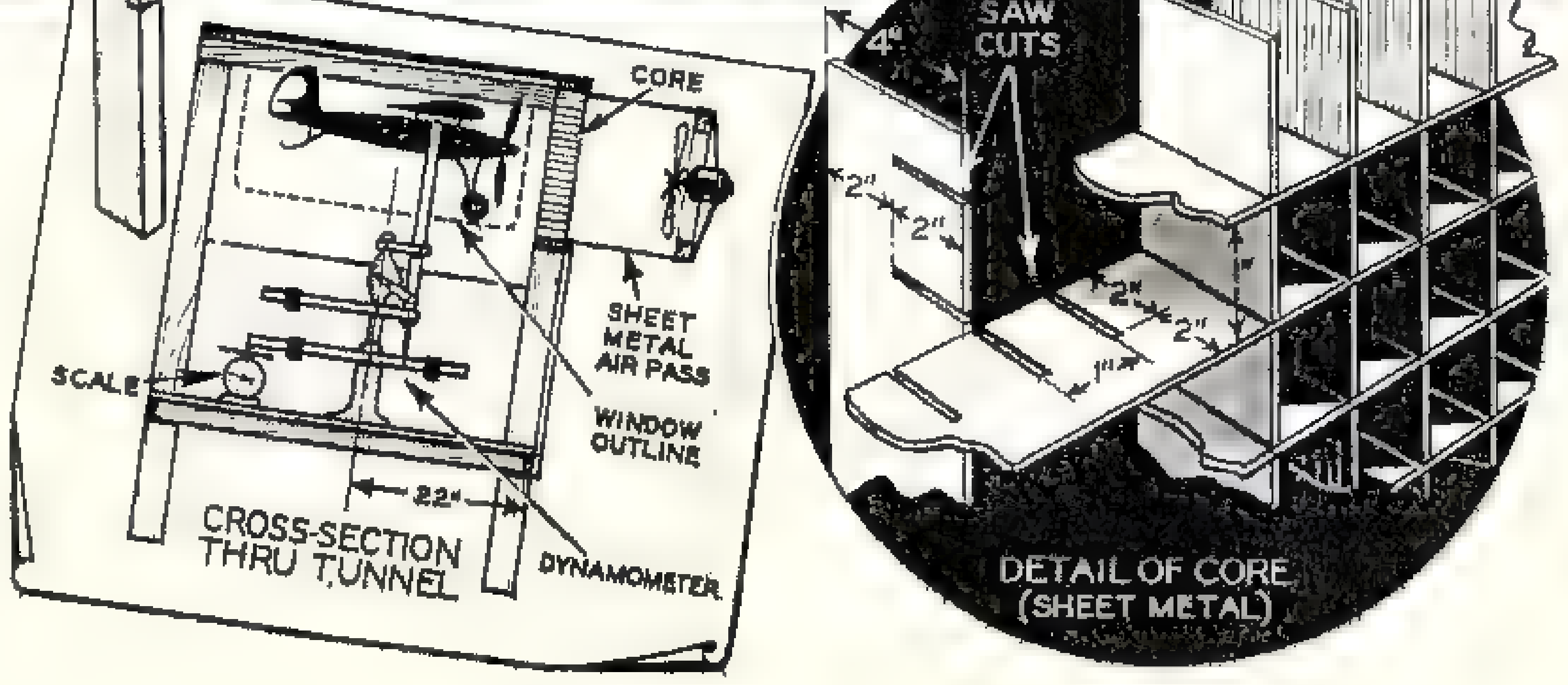
WELD
STRAP IRON
3/4" X 36" IRON PIPE
COTTER PIN
WASHER
BATTERY FOR LIGHTS
3/8" RODS
12" TIRE & WHEEL
WELD
FIG 10
CLEVIS BOLT
3/8" ROD
COTTER PIN
1-1/2" X 2" OAK STRINGERS
SPRING STEEL BUMPER
WELD TO STRAP IRON SUPPORT AND BOLT TO INSIDE OF FRAME MEMBERS
PLYWOOD BOX HOLDS BATTERY
ARM OF 3/16" BAR, OR 3/8" DIAM. ROD AS SHOWN IN FIG. 10
PIPE NIPPLE
12"
RIVET HOOD TO THIS FRAME
5" ARM
1/2" PLYWOOD FLOOR
SEE SECTION OF AXLE
FLATTEN END
SEE DETAIL OF STEERING KNUCKLE
SPINDLE TO SUIT WHEEL USED
1/2" BOLT
WELD
1/4" CARRIAGE BOLT
1"
1/4"
3/4"
1 1/2"
WELD
OAK
3"
1 1/2"
SECTION OF AXLE
3/16" STEEL BAR
TURN TO FIT WHEELBEARING

FIG. 5 – FRONT END OF CHASSIS SHOWING STEERING ASSEMBLY

FIG. 9 DETAIL OF STEERING KNUCKLES

TEST YOUR MODEL AIRPLANES in this WIND TUNNEL

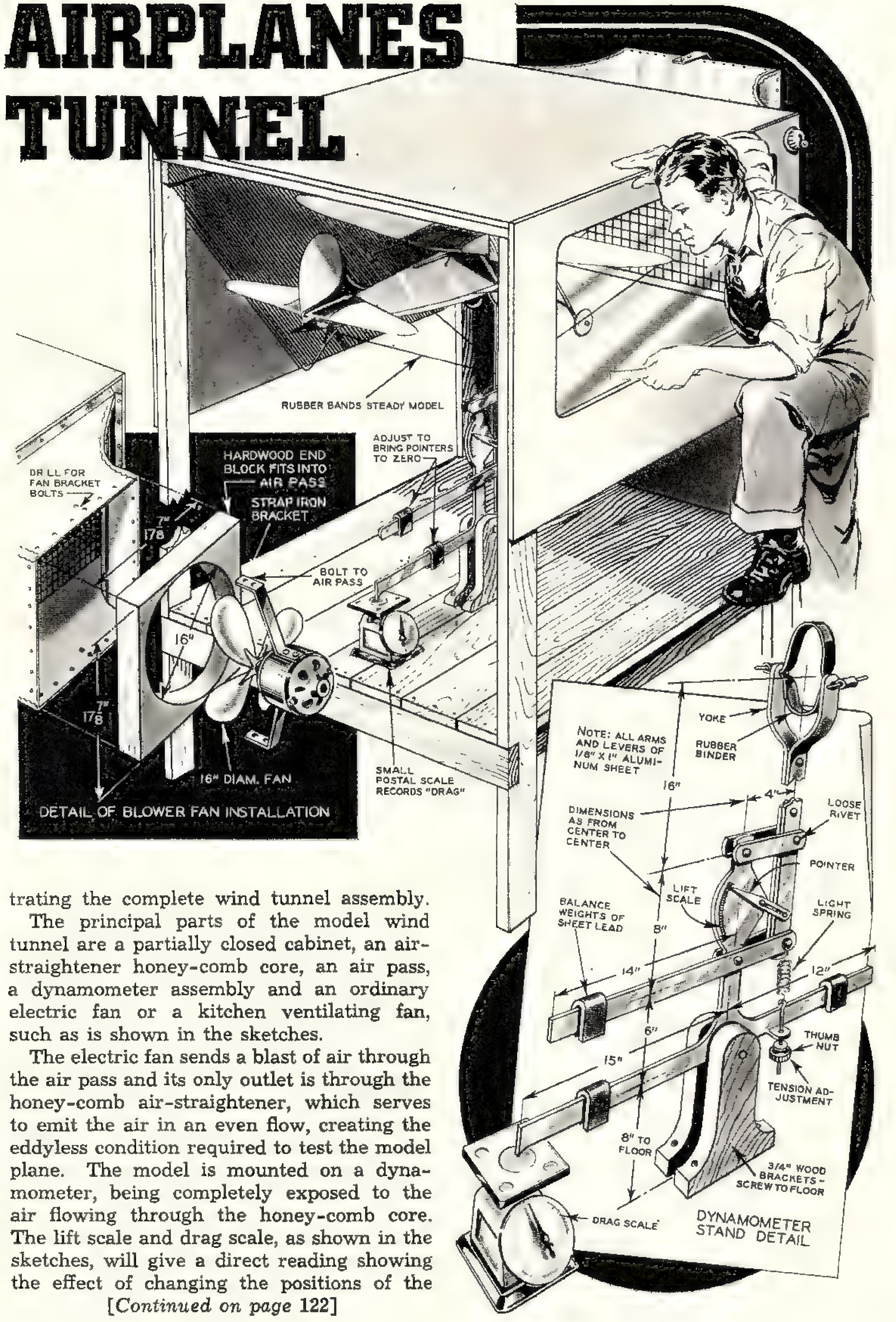

TOP PLATES OF 3/4" X 3" STOCK
48"
48"
CORNER POSTS OF 4" X 3/4" STOCK
TOP SILLS OF ANY SCRAP LUMBER
WALLBOARD
CELLULOID OR GLASS WINDOW
46"
25 1/2"
15"
18"
46 1/2"
3/4" FLANGES - NAIL OR SCREW TO END FRAMING
HONEYCOMB CORE 18" X 46-1/2" TO FIT INTO END OF CABINET
46 1/2"
16"
18"
18"
18"
18"
3/8" FLOORING
TUNNEL CABINET
AIR-STRAIGHTENER CORE (SEE DETAIL BELOW)
SOLDER OR WELD
AIR PASS OR CONDUIT (HEAVY TIN OR SHEET IRON)
WALL BOARD


CORE
SCALE
SHEET METAL AIR PASS
WINDOW OUTLINE
22"
DYNAMOMETER
CROSS-SECTION THRU TUNNEL
4"
SAW CUTS
2"
2"
2"
2"
DETAIL OF CORE (SHEET METAL)

Shown above and at right are the general constructional details of the cabinet, honeycomb air-straightener core and air pass of the novel model plane wind tunnel. The circular sketch shows how the honey-comb core is constructed by notching and inter-locking strips of sheet metal. The sketches on the opposite page show additional details of the air pass construction as well as complete details of the dynamometer assembly. Practically all parts are made from easily obtained scrap materials.

IN RESPONSE to numerous requests received during the past few months, MODERN MECHANIX is herewith reprinting plans and details for the construction of a miniature wind tunnel for testing model airplanes. This article, in its original form, appeared in the MM "Flying Manual," 1932 edition, and was written by Dick Cole.

Many experimenters have undoubtedly tried to test their models in the blast of air from an electric fan, but such tests are highly unsatisfactory for the reason that the wind created by the fan is a mass of whirling currents—a miniature tornado. To test a model plane successfully, it must be placed in a flow of air that is moving with equal velocity throughout its entire cross-sectional area, and the air stream must be free of whirling eddies. How this ideal condition is brought about is shown in the sketch illustrating the complete wind tunnel assembly.


RUBBER BANDS STEADY MODEL
ADJUST TO BRING POINTERS TO ZERO
DRILL FOR FAN BRACKET BOLTS
HARDWOOD END BLOCK FITS INTO AIR PASS
STRAP IRON BRACKET
17 7/8"
BOLT TO AIR PASS
16"
17 7/8"
16" DIAM. FAN
SMALL POSTAL SCALE RECORDS "DRAG"
DETAIL OF BLOWER FAN INSTALLATION
YOKE
NOTE: ALL ARMS AND LEVERS OF 1/8" X 1" ALUMINUM SHEET
RUBBER BINDER
16"
4"
LOOSE RIVET
DIMENSIONS AS FROM CENTER TO CENTER
POINTER
LIFT SCALE
BALANCE WEIGHTS OF SHEET LEAD
8"
LIGHT SPRING
14"
12"
6"
THUMB NUT
15"
TENSION ADJUSTMENT
8" TO FLOOR
3/4" WOOD BRACKETS - SCREW TO FLOOR
DRAG SCALE
DYNAMOMETER STAND DETAIL

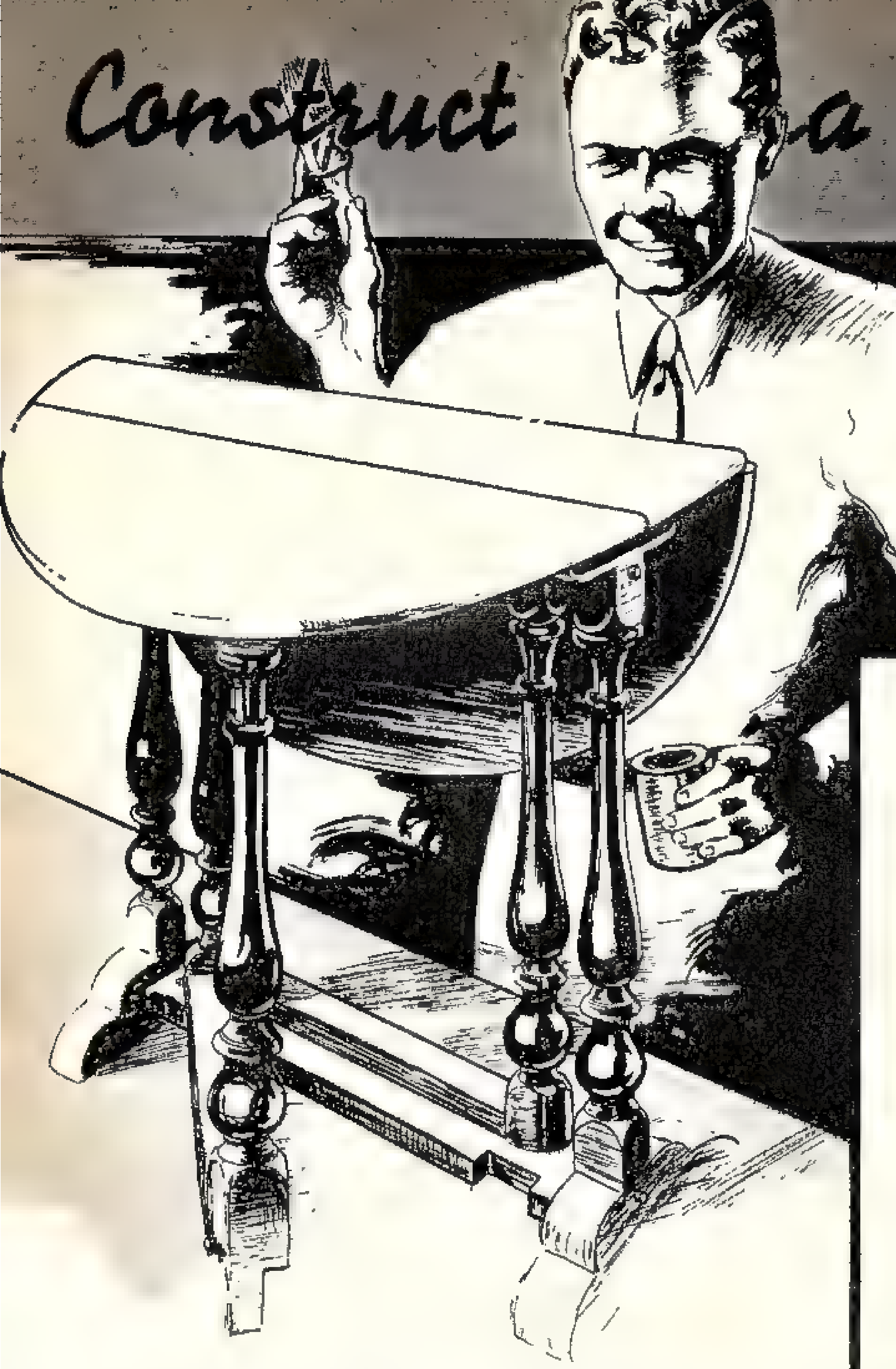
The principal parts of the model wind tunnel are a partially closed cabinet, an air-straightener honey-comb core, an air pass, a dynamometer assembly and an ordinary electric fan or a kitchen ventilating fan, such as is shown in the sketches.

The electric fan sends a blast of air through the air pass and its only outlet is through the honey-comb air-straightener, which serves to emit the air in an even flow, creating the eddyless condition required to test the model plane. The model is mounted on a dynamometer, being completely exposed to the air flowing through the honey-comb core. The lift scale and drag scale, as shown in the sketches, will give a direct reading showing the effect of changing the positions of the

[Continued on page 122]

Construct a SMALL GATE LEG TABLE

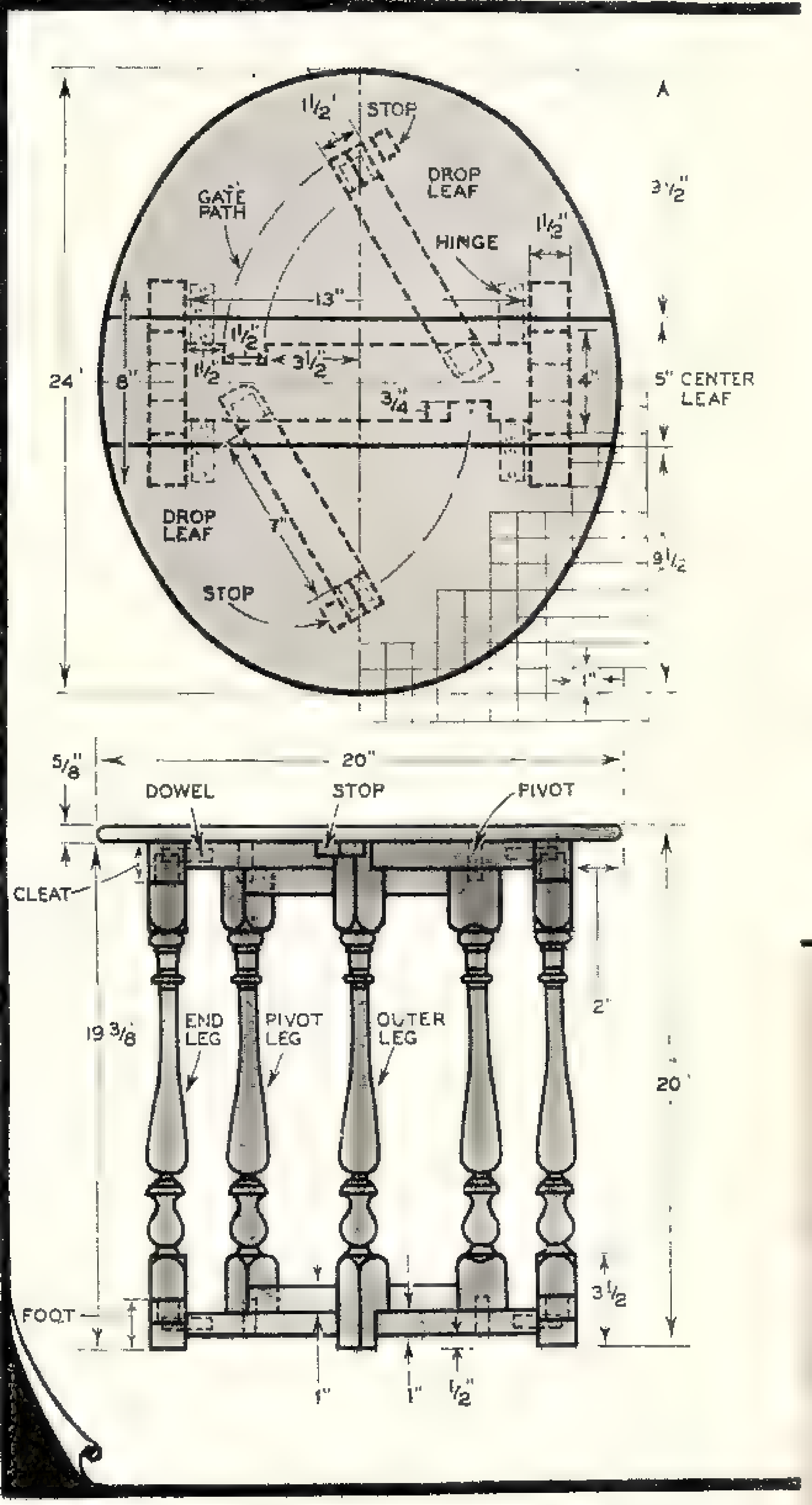
by
John G. Shea



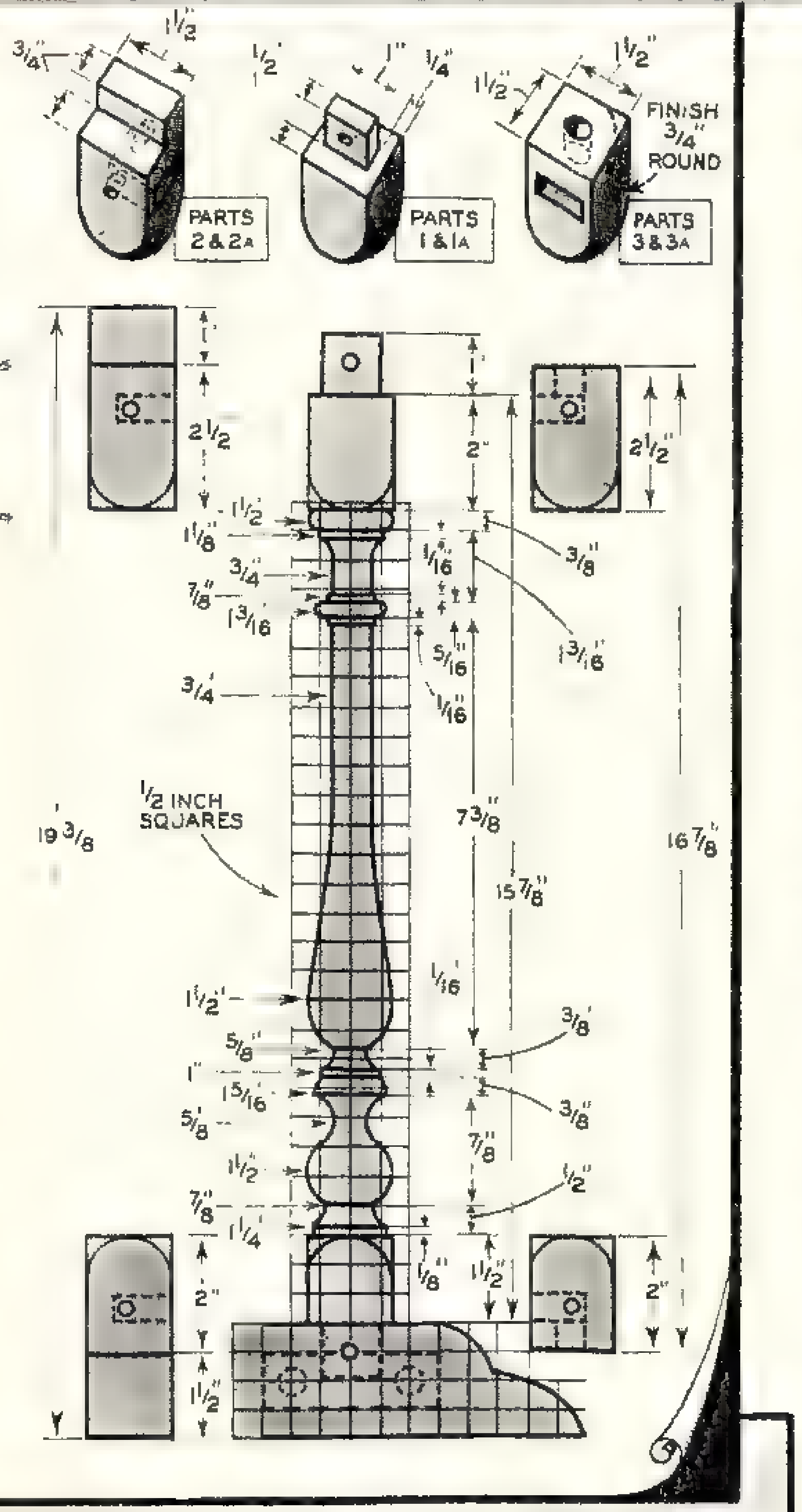
SOMEONE has described certain articles of furniture as possessing the quality of coziness. This quality is amply evinced in the small gate leg table, for it is both cozy and comfortable, and, furthermore, because of its attractive turning, it is a highly decorative piece of furniture.

The person who is interested in wood turning will undoubtedly find a friendly challenge in the construction of this article. Aside from the skill necessary to turn out six duplicate legs, the craftsman will not encounter any unusual complications in its construction. All construction is obvious and not in the least complicated.

In making this small gate leg table, place emphasis upon all those important "touches" which put good furniture across. Such "touches" include the proper dulling of edges (as indicated in the plan), the use of wooden pegs to both strengthen and lend a quaint crafty appearance to all mortise and tenon joints, and finally a proper finish to give life and warmth to the completed article.


1½"
STOP
GATE PATH
DROP LEAF
HINGE
1½"
3½"
13"
24"
8"
1½"
3½"
¾"
4"
5" CENTER LEAF
DROP LEAF
STOP
9½
⅝"
20"
DOWEL
STOP
PIVOT
CLEAT
19 ⅜
END LEG
PIVOT LEG
OUTER LEG
2"
20"
3½
FOOT
1"
1"
½"

If each part is shaped carefully, final assembly will be very simple. Although almost any wood can be used, either walnut or cherry is suggested. A thorough sanding before any finishing is applied will give a more pleasing appearance to the completed project. Plenty of rubbing with a soft cloth will give a warm and attractive luster to the finish.


PARTS 2&2A
PARTS 1&1A
FINISH ¾" ROUND
PARTS 3&3A
½ INCH SQUARES
19⅜
15⅞
16⅞
7⅜
2½
2"

Before turning the legs the builder should make a full-size pattern. With this as a guide, no difficulty should be experienced in turning out exact duplicates. After the turning is finished, the mortises and tenons are cut. The dimensions of the curves shown in the detail can be varied to suit individual taste.

Any one of a variety of different woods can be used. It is recommended, however, that either walnut or cherry be used.

Note that the sizes given below are of the *finished stock*. Stock should be cut slightly larger than these dimensions to make allowance for dressing and working to actual size.

Turned Members:
- 2 pieces, 1½"x1½"x17⅞" (end posts)
- 2 pieces, 1½"x1½"x19⅜" (gate posts)
- 2 pieces, 1½"x1½"x16⅞" (gate pivot posts)

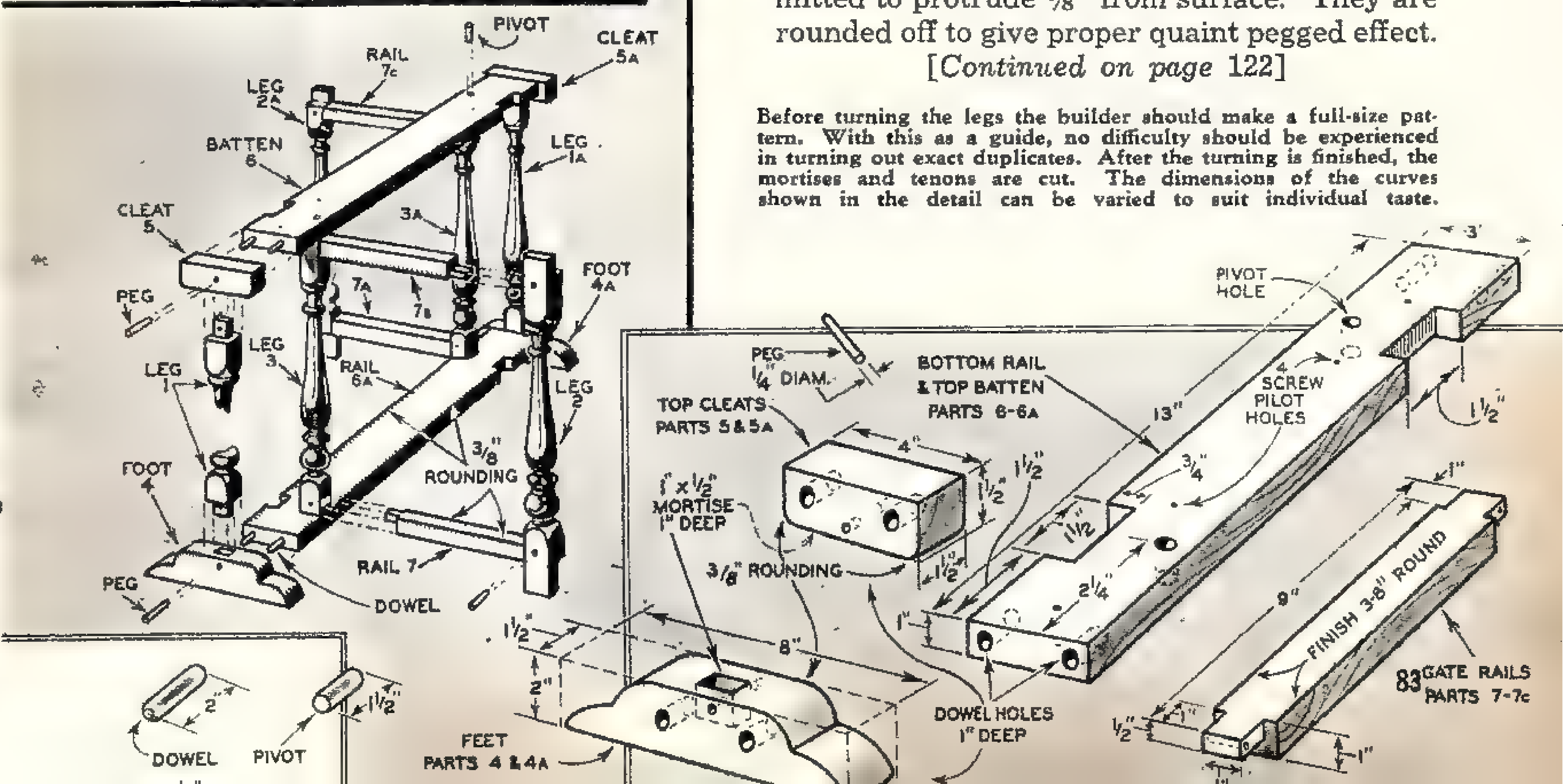
Because it is necessary to duplicate exactly the turning of all these members, it is suggested that the worker cut an exact and full size pattern of the turning before starting the operation. With this pattern as a guide, the craftsman can readily obtain the exact shaping desired. After the turning is finished, cut mortises and tenons, as indicated in plan, on various turned members. Mark and cut half lap cut-outs on ends of outer gate posts.

Feet and Top Cleats:
- 2 pieces, 1½"x2"x8" (feet)
- 2 pieces, 1½"x1½"x4" (top cleats)

Square to specified sizes. Mark and cut mortises. Cut pattern for foot shaping as indicated in graph detail. Mark this shaping on two opposite faces of each other. Cut and finish to exact shaping of pattern. Round under edge of top cleats.

Assemble turned posts to feet and top cleats. Secure joints with glue and insert wooden pins while assembly is being held together under clamp pressure. These pins should be permitted to protrude ⅛" from surface. They are rounded off to give proper quaint pegged effect.

[*Continued on page* 122]


PIVOT
CLEAT 5A
RAIL 7C
LEG 2A
BATTEN 6
LEG 1A
CLEAT 5
3A
7A
7B
FOOT 4A
PEG
LEG 3
LEG 1
RAIL 6A
LEG 2
3/8" ROUNDING
FOOT
RAIL 7
PEG
DOWEL
DOWEL
PIVOT
2"
1½"
FEET PARTS 4 & 4A
PEG ¼" DIAM.
TOP CLEATS PARTS 5&5A
BOTTOM RAIL & TOP BATTEN PARTS 6-6A
1" x ½" MORTISE 1" DEEP
3/8" ROUNDING
8"
4"
1½"
13"
¾"
2¼"
PIVOT HOLE
4 SCREW PILOT HOLES
3"
DOWEL HOLES 1" DEEP
9"
FINISH 3-8" ROUND
GATE RAILS PARTS 7-7C
½"
1"

HOW TO CUT SECTIONS FOR YOUR MICROSCOPE

Homemade microtome is easy to build and use to get thin sections.

by
Julian D. Corrington, Ph. D.

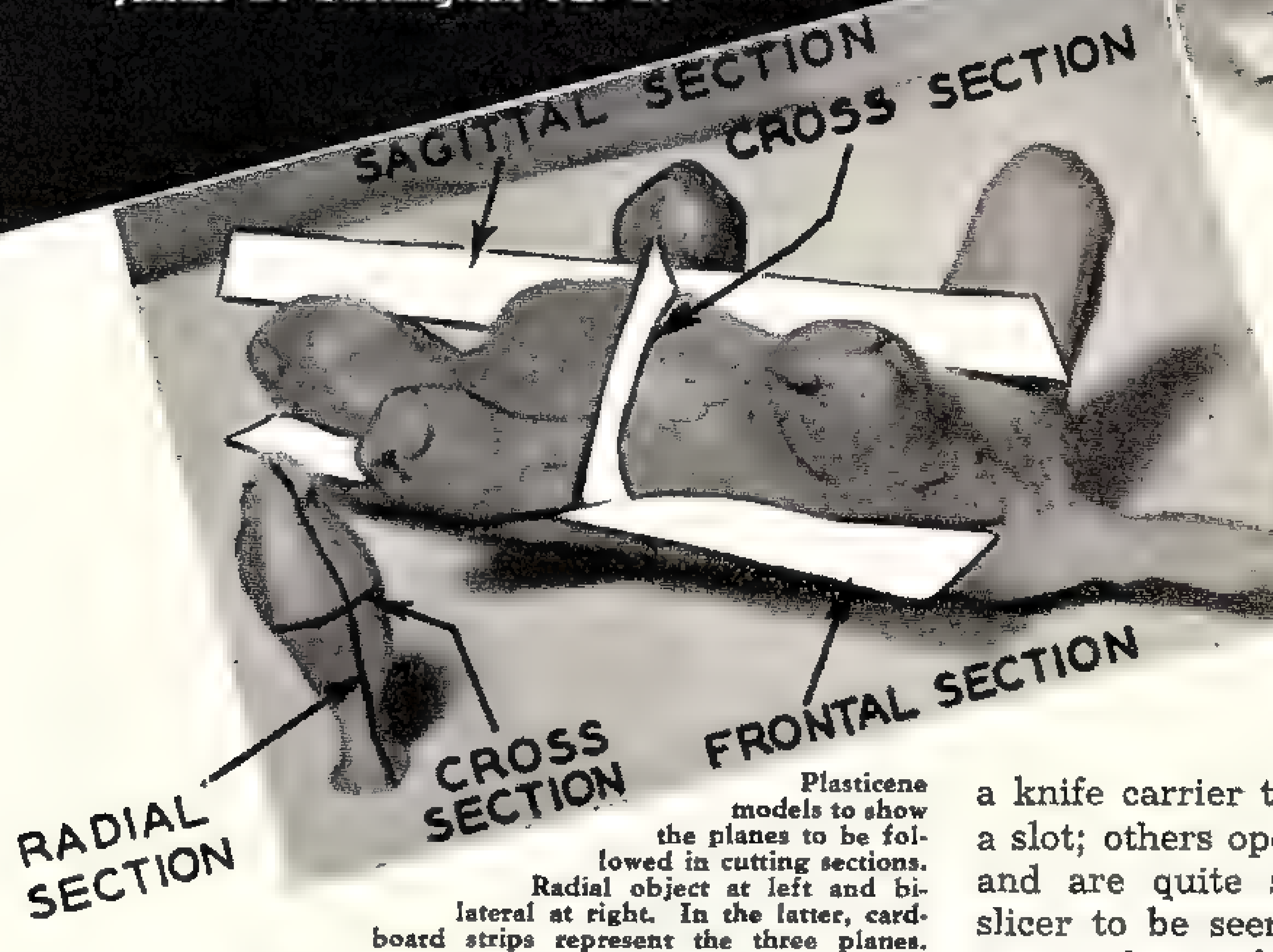
READERS of preceding articles on microscopy are now familiar with the parts and operation of a microscope, and have made studies of pond life, insects and other introductory matters. They have made temporary slides and a few whole mounts that require little if any technique. So now is the time to take the next and the biggest of all steps in microscopy, and to learn how to cut thin sections and make really professional and permanent slides that can be preserved, sectioned, stained and mounted in balsam.

This is a sizeable job and the whole story cannot be told in a single chapter. In the present installment we shall go into the details of cutting thin sections, and other stages in microtechnique will follow along in succeeding issues.

Sectioning—the cutting of thin slices—is necessary whenever the material to be observed under the microscope combines thickness with opacity, and this is usually the case. It is possible to secure surface views of such objects as skin, liver or heart, and of stems, leaves, stones and minerals; but generally it is impossible or inadvisable to try to make permanent mounts of most of these, and no information at all is obtained of the internal structure or of the kinds of cells that make up plant and animal organs.

This is the eighth in a series of articles published by MODERN MECHANIX on this fascinating subject of microscopy. Previous articles are as follows:
April—"Documentary Evidence"—A study of the characteristics of handwriting and typewriting, and how the microscope is used to track down law breakers.
March—"The Silent Sherlock"—The microscope and its use in present day crime detection.
February—"Finger Prints in Fur"—How the microscope is used by the fur industry for identification purposes.
December—"Hitching a Microscope to Your Camera"—How a camera can be used with a microscope to preserve the wonders seen by the eye.
November—"The Autumn Empire of Insects"—The thrills of big game hunting are revealed under the lense of the microscope in the study of common insect species.
October—"Microscope Reveals Mysteries of Life in Water"—How to delve into the wonders of nature with a microscope as your magic key to the storehouse of life at its conception.

At the upper left is pictured a cross section of a lily flower bud showing all the structural parts of a typical flower. At its right is a longitudinal section of a dandelion flower. Above is shown the hand microtome described in the text.



Plasticene models to show the planes to be followed in cutting sections. Radial object at left and bilateral at right. In the latter, cardboard strips represent the three planes.

Slices thin enough to permit the use of transmitted light are necessary and so a complicated technique of procedures has grown up to serve this need and to prepare the beautiful and permanent slides that are in common use in high school and college courses in biology.

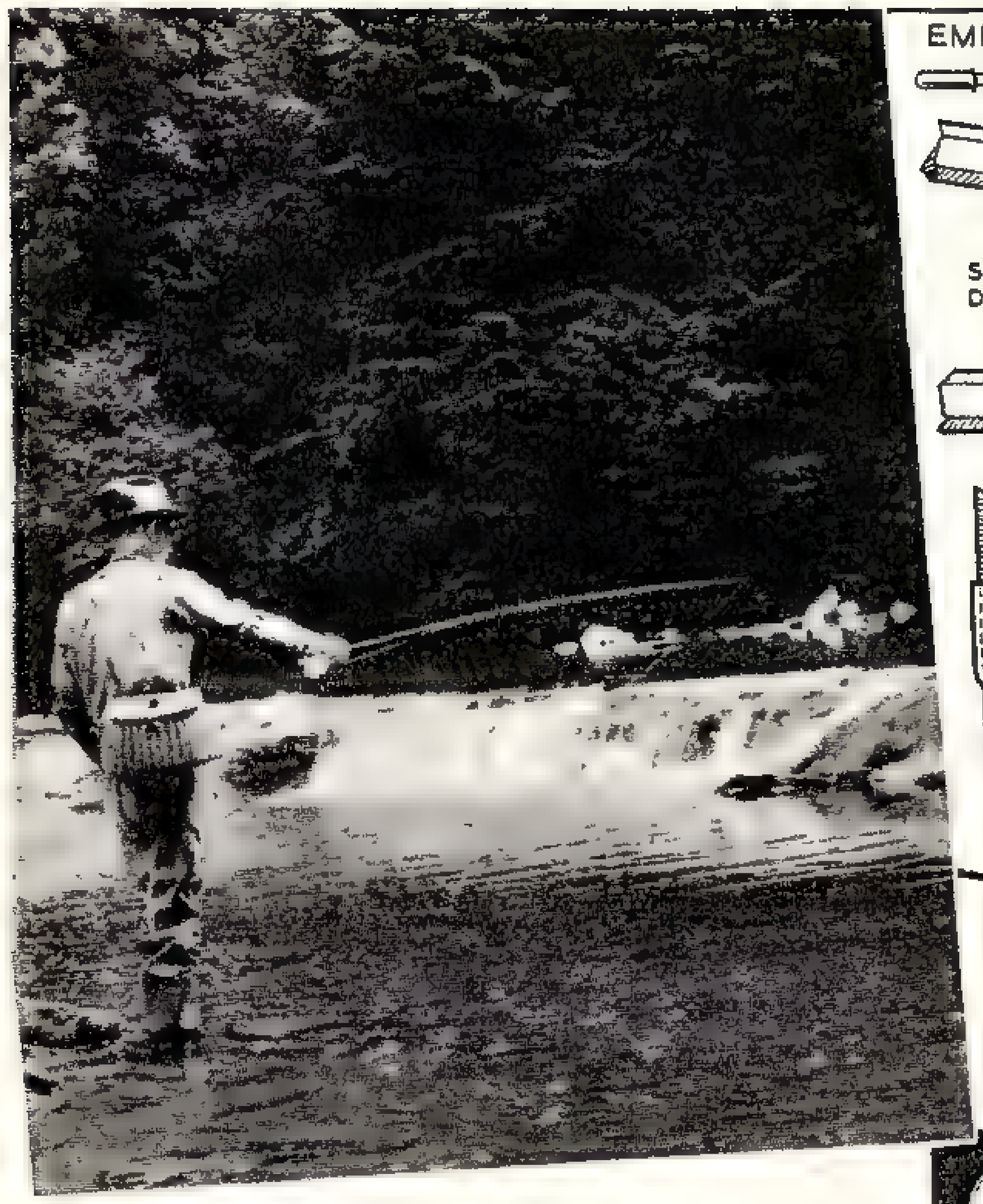
If you have never seen this sort of slide we suggest that you purchase one from a supply house or dealer so as to have it as a model in making your own. Ask for a cross section of basswood or other tree stem or of lily flower bud, double stained. On the blank glass slide has been placed an exceedingly thin section of the material, permanently preserved against decay and stained with various dyes to give color and contrast to otherwise almost transparent structures. The section has been rendered translucent by means of an oil and has been placed in Canada balsam and then a cover glass added. After thorough drying to harden the balsam, the slide was cleaned and labeled. It is such a slide that we are going to make, taking one of the major steps this month.

Advanced and detailed studies may require sections that are not only very thin, but of a known and uniform thinness, and hence there have been developed a number of types of precision instruments known as *microtomes*, from the Greek words *small*, and *to cut*. Some use a knife carrier that slides back and forth in a slot; others operate on the rotary principle and are quite similar to the rotary meat slicer to be seen in a meat market. Some one, in fact, referred to this style of microtome as "a glorified meat slicer." Machine microtomes cost from fifteen to several hundred dollars. For all ordinary and practical purposes, however, a hand microtome, as described in this article will do the trick and can be made by anyone familiar with the use of tools.

First, though, there is the free-hand method of cutting sections which employs no microtome at all, and whether or not you plan to operate a microtome you should know and practice this system. Every microscopist worthy of the name should go through this step in his training and acquire a bit of the necessary manual dexterity, so often lacking in this machine age.

Recommended as practice material at this season of the year are leaf buds from trees, particularly the larger types, such as horse chestnut. The knife may be either the old-fashioned razor, as shown in an accompanying illustration, or a safety-razor blade held in a carrier with folding handle—an object commonly sold in the five and ten cent stores. The stiff type of blade is better for our purposes than the flexible one. New blades are readily inserted in the carrier when the one in use becomes dulled. Hard woods

HINTS FOR THE FISHERMAN



by Dick Cole

FISHING can probably be classed as one of the most universal and cosmopolitan of all outdoor sports. It is quite safe to say that it plays a part in every man's life at some time or other, perhaps beginning with a hickory branch, grocery store cord and a bent pin, and leading up to the prized possession of a "Thomas" or "Hardy" rod, taper lines, and a vast collection of lures and flies.

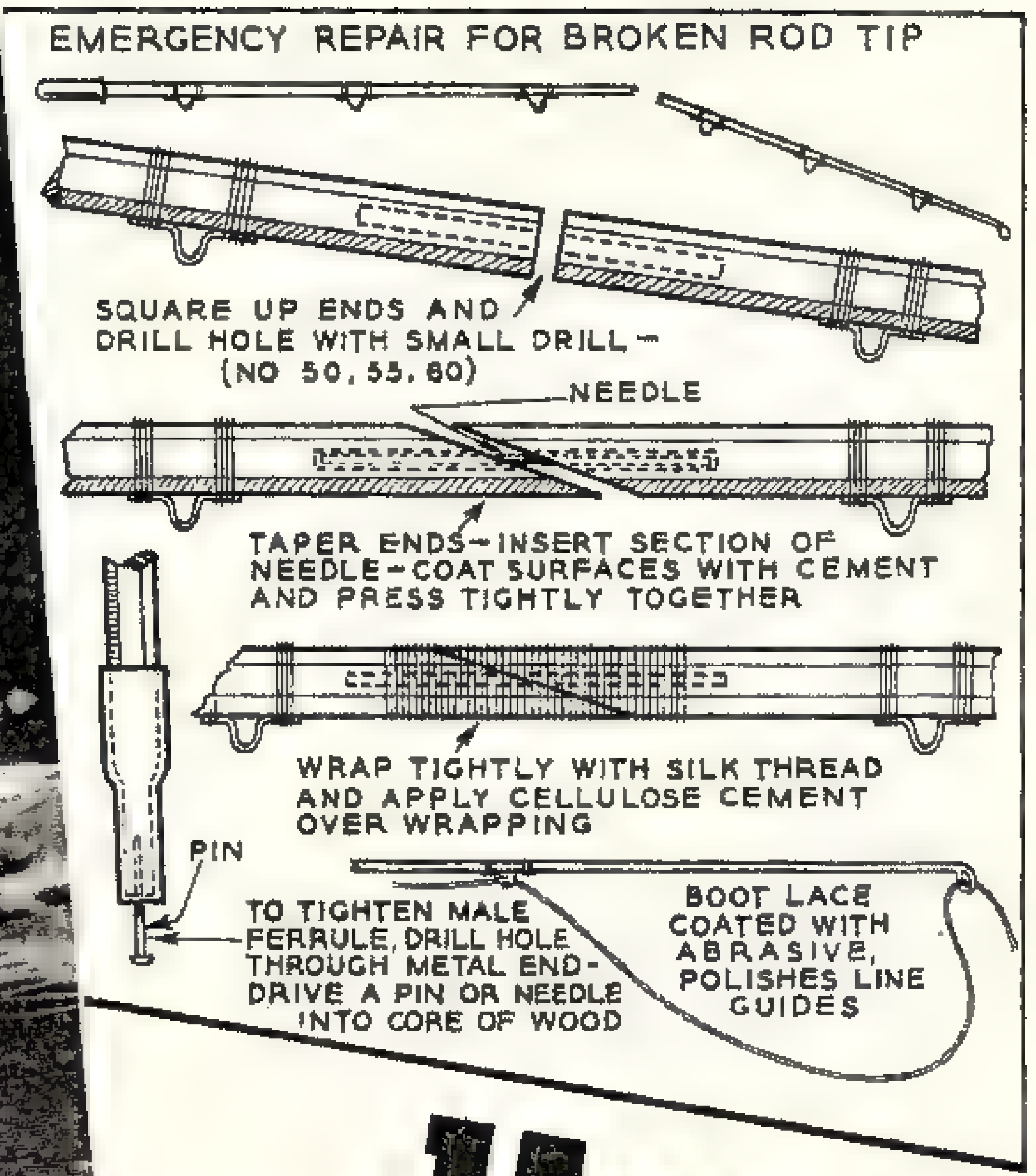
Fishing—angling—is becoming a truer sport every year. Our forefathers fished solely to get fish. We of today fish for the joy of outwitting the fish with artifice. Our forefathers' tackle consisted of a solid bamboo "pole" with a length of 10-cent linen line tied to it—no reel; eyed hooks at 5 cents a dozen, a can of worms and a rusty nut for a sinker. The angler's tackle of today can easily run into three, or even four figures.

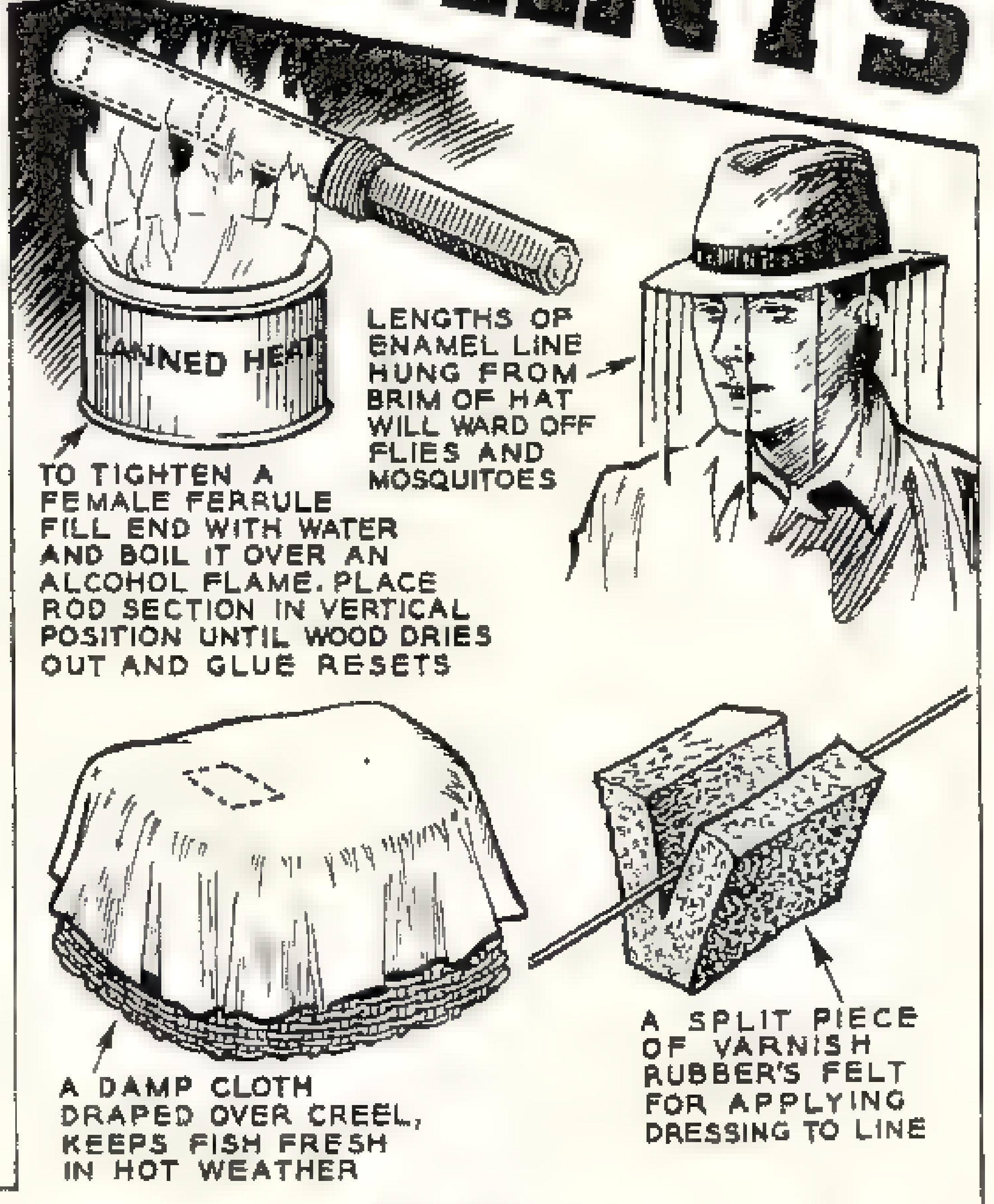
However, to gain full enjoyment of angling as a sport, it is not necessary to invest a large sum of money. Perhaps a $10.00 domestic rod will not handle a $2.00 "level" line with the same nicety that a $150.00 tournament rod will handle a $15.00 double taper line, but, when the two outfits are put to actual use on a stream, maybe the $12.00 outfit will out-fish the aristocratic equipment. It really is the man at the butt-end of the rod that decides the issue.

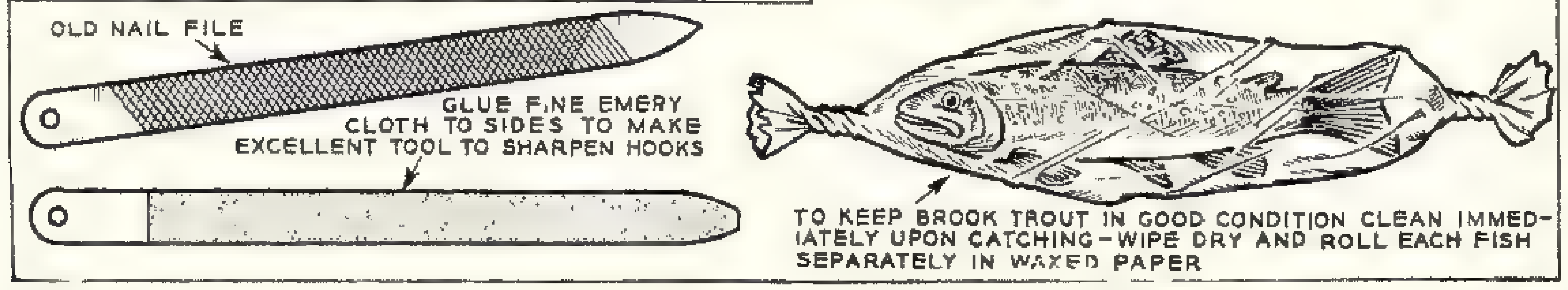
It is not the intention of this article to give a treatise on the art of bait and fly casting, but rather to pass along to fellow anglers a few little kinks that may aid them in gaining a fuller enjoyment of their favorite sport.

What can be more annoying than to break a flyrod tip section far from camp? However, a satisfactory repair job can be made right on the stream if the angler carries some simple equipment with him. This consists of a packet of needles of assorted sizes, a tube of celluloid cement, several small twist drills—say, No. 50, 55 and 60—and a spool of strong silk thread.

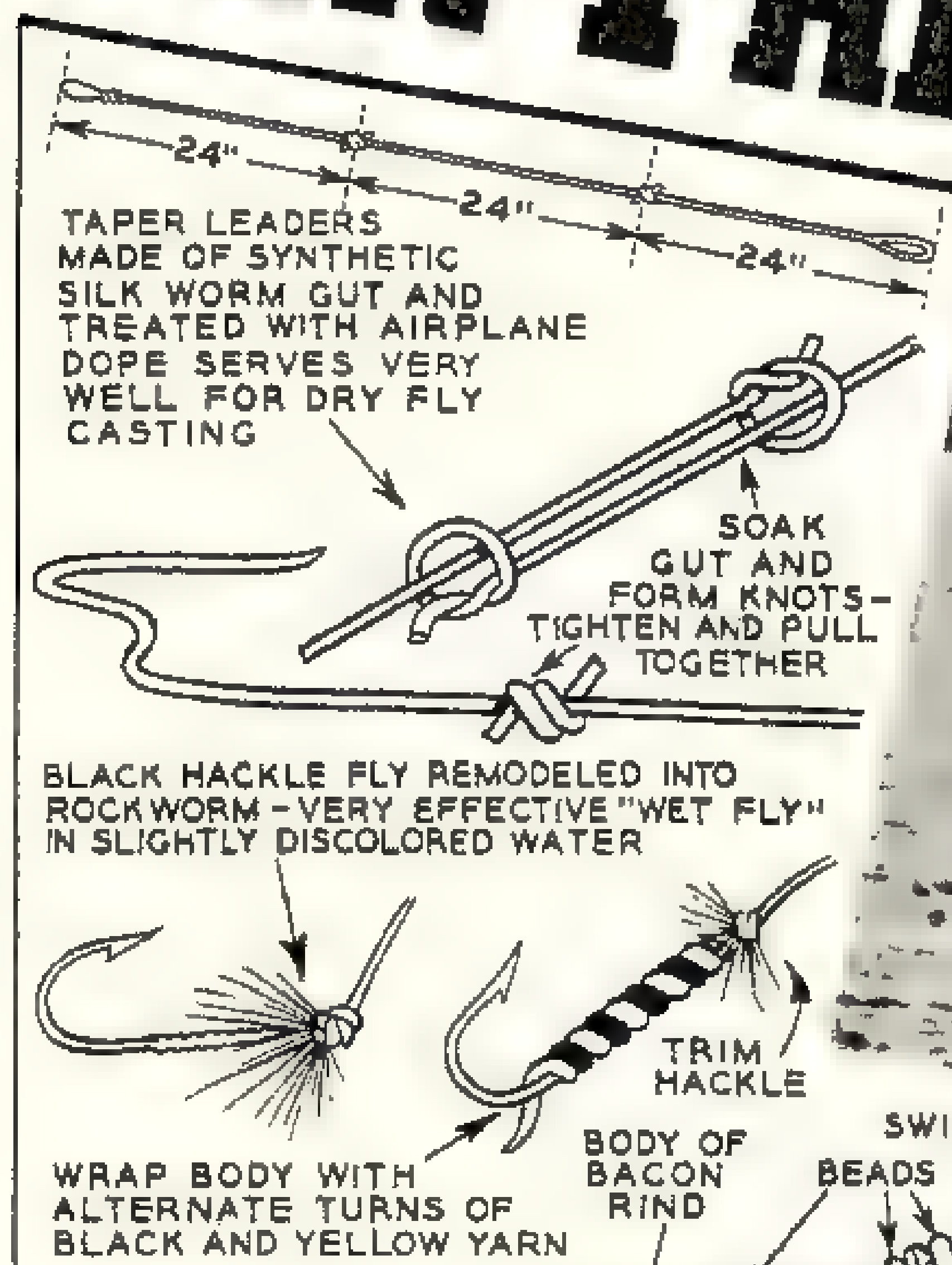
To proceed with the repair job, the broken ends

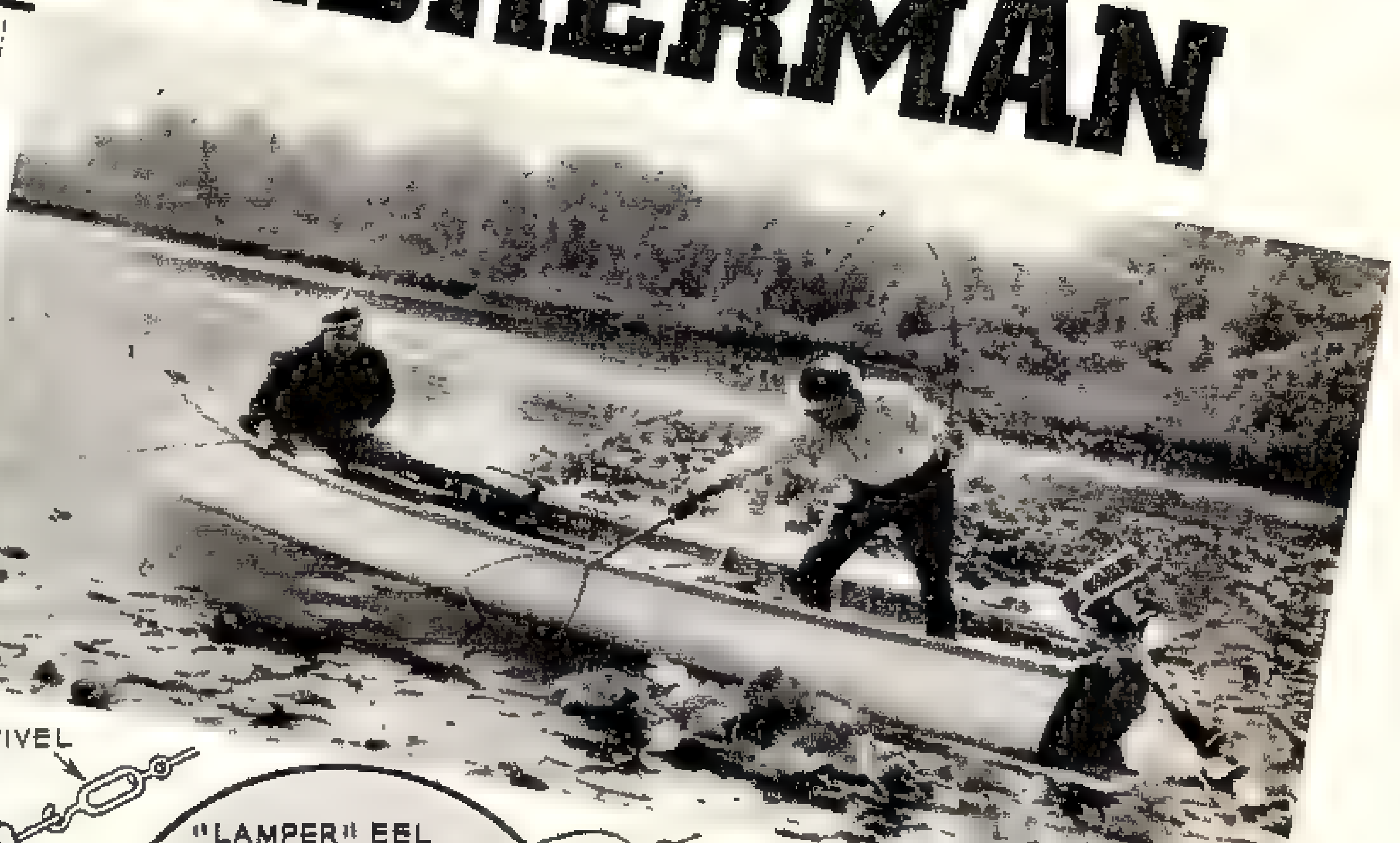

EMERGENCY REPAIR FOR BROKEN ROD TIP
SQUARE UP ENDS AND DRILL HOLE WITH SMALL DRILL—(NO 50, 55, 60)
NEEDLE
TAPER ENDS—INSERT SECTION OF NEEDLE—COAT SURFACES WITH CEMENT AND PRESS TIGHTLY TOGETHER
WRAP TIGHTLY WITH SILK THREAD AND APPLY CELLULOSE CEMENT OVER WRAPPING
PIN
TO TIGHTEN MALE FERRULE, DRILL HOLE THROUGH METAL END-DRIVE A PIN OR NEEDLE INTO CORE OF WOOD
BOOT LACE COATED WITH ABRASIVE, POLISHES LINE GUIDES

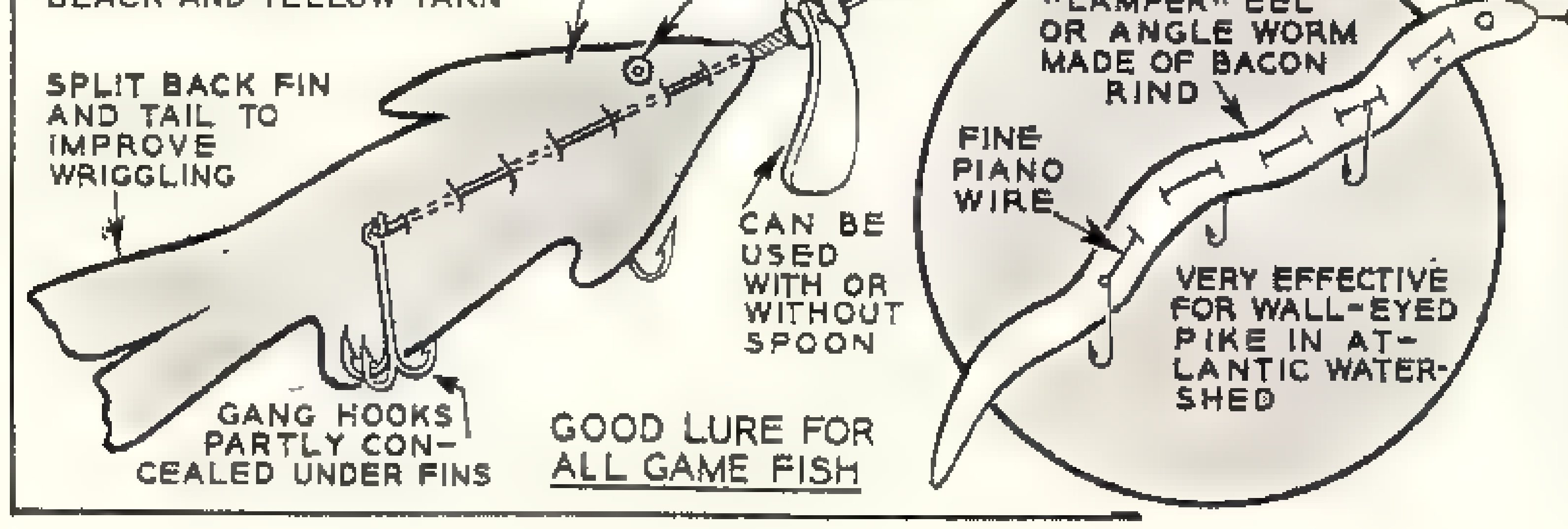

CANNED HEAT
LENGTHS OF ENAMEL LINE HUNG FROM BRIM OF HAT WILL WARD OFF FLIES AND MOSQUITOES
TO TIGHTEN A FEMALE FERRULE FILL END WITH WATER AND BOIL IT OVER AN ALCOHOL FLAME. PLACE ROD SECTION IN VERTICAL POSITION UNTIL WOOD DRIES OUT AND GLUE RESETS
A DAMP CLOTH DRAPED OVER CREEL, KEEPS FISH FRESH IN HOT WEATHER
A SPLIT PIECE OF VARNISH RUBBER'S FELT FOR APPLYING DRESSING TO LINE


OLD NAIL FILE
GLUE FINE EMERY CLOTH TO SIDES TO MAKE EXCELLENT TOOL TO SHARPEN HOOKS
TO KEEP BROOK TROUT IN GOOD CONDITION CLEAN IMMEDIATELY UPON CATCHING—WIPE DRY AND ROLL EACH FISH SEPARATELY IN WAXED PAPER

Broken rods can be quickly repaired by splicing the break in the manner described in the details at upper right. Lower illustrations show how a loose ferrule may be tightened simply by heating it over a canned heat flame. To ward off annoying insects the fisherman may attach lengths of old fishline to the brim of his hat. A quick way to apply dressing to a fishing line is to split a piece of varnish-rubber felt to form an applicator. To keep fish from spoiling, clean and wrap in waxed paper.

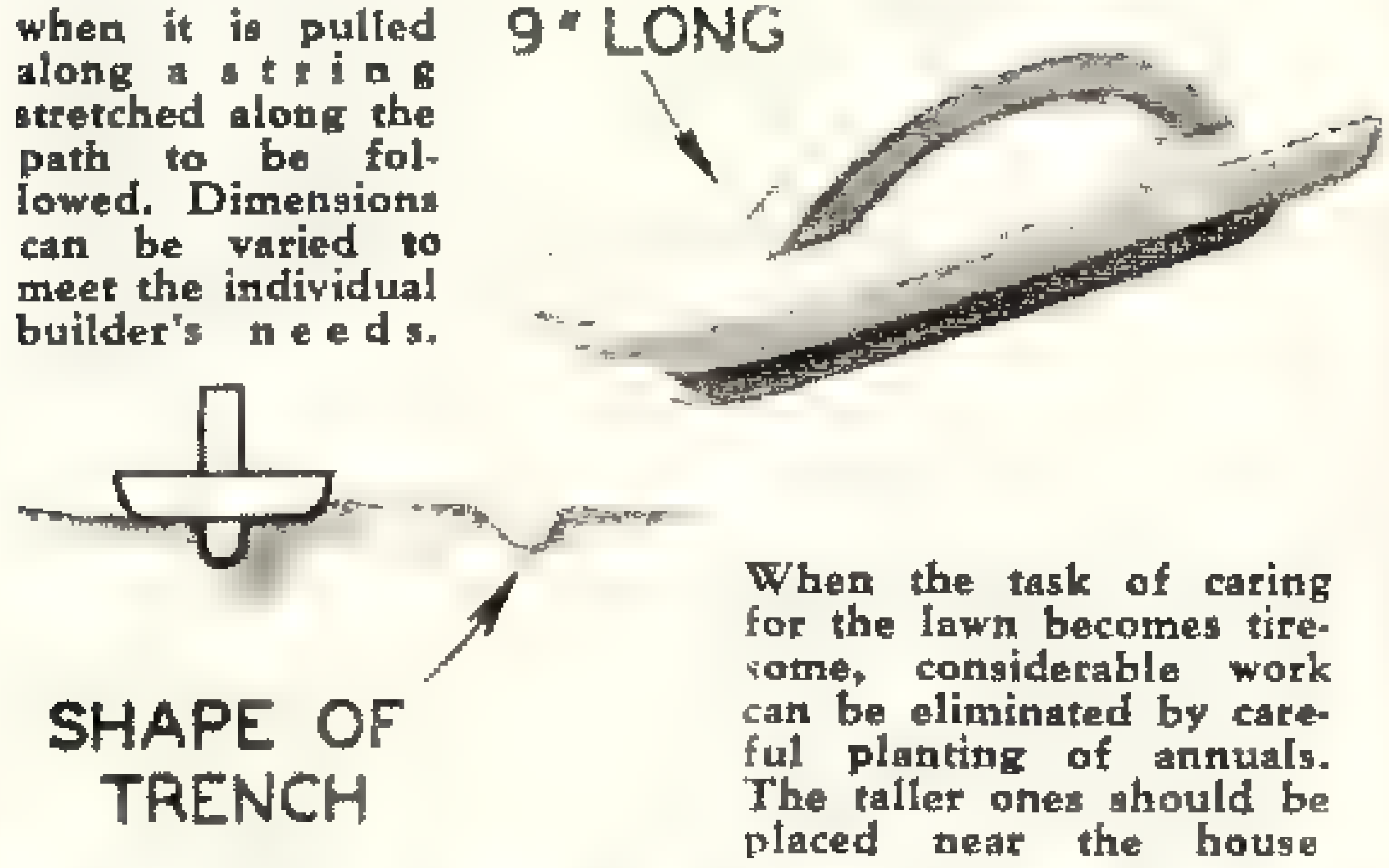

24"
24"
24"
TAPER LEADERS MADE OF SYNTHETIC SILK WORM GUT AND TREATED WITH AIRPLANE DOPE SERVES VERY WELL FOR DRY FLY CASTING
SOAK GUT AND FORM KNOTS-TIGHTEN AND PULL TOGETHER
BLACK HACKLE FLY REMODELED INTO ROCKWORM-VERY EFFECTIVE "WET FLY" IN SLIGHTLY DISCOLORED WATER
TRIM HACKLE
WRAP BODY WITH ALTERNATE TURNS OF BLACK AND YELLOW YARN



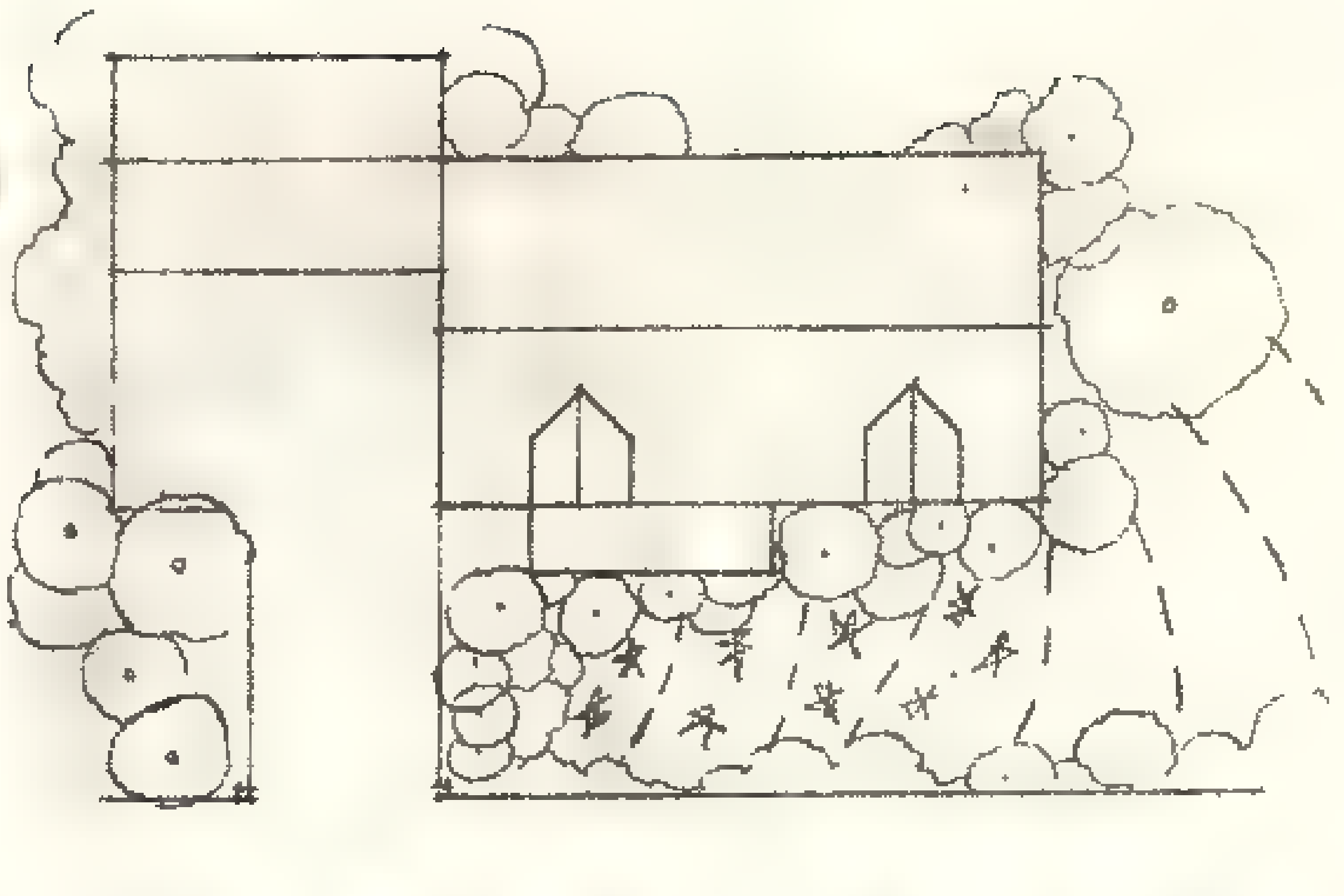

SWIVEL
BODY OF BACON RIND
BEADS
SPLIT BACK FIN AND TAIL TO IMPROVE WRIGGLING
CAN BE USED WITH OR WITHOUT SPOON
GANG HOOKS PARTLY CONCEALED UNDER FINS
GOOD LURE FOR ALL GAME FISH
"LAMPER" EEL OR ANGLE WORM MADE OF BACON RIND
FINE PIANO WIRE
VERY EFFECTIVE FOR WALL-EYED PIKE IN ATLANTIC WATERSHED

Every fisherman derives more satisfaction from the sport when he is able to land his catch with lures of his own creation. Several effective lures are shown above. A black hackle fly can be made into an effective "wet-fly" by wrapping the hook with alternate turns of black and yellow yarn. A good lure for all game fish can be made from bacon rind as shown in the lower detail.

This easily constructed wood trencher makes uniform rows when it is pulled along a string stretched along the path to be followed. Dimensions can be varied to meet the individual builder's needs.



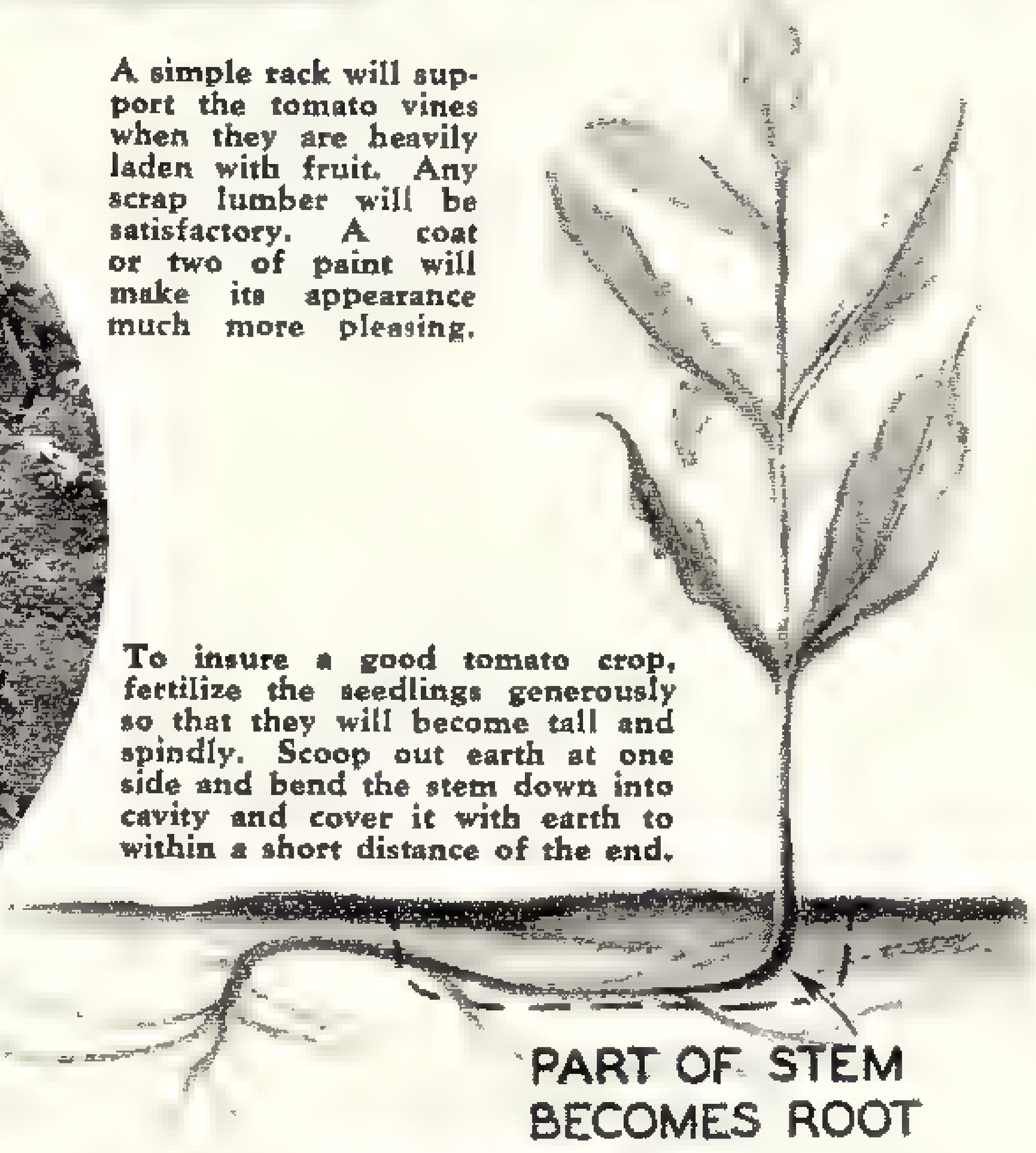
When the task of caring for the lawn becomes tiresome, considerable work can be eliminated by careful planting of annuals. The taller ones should be placed near the house



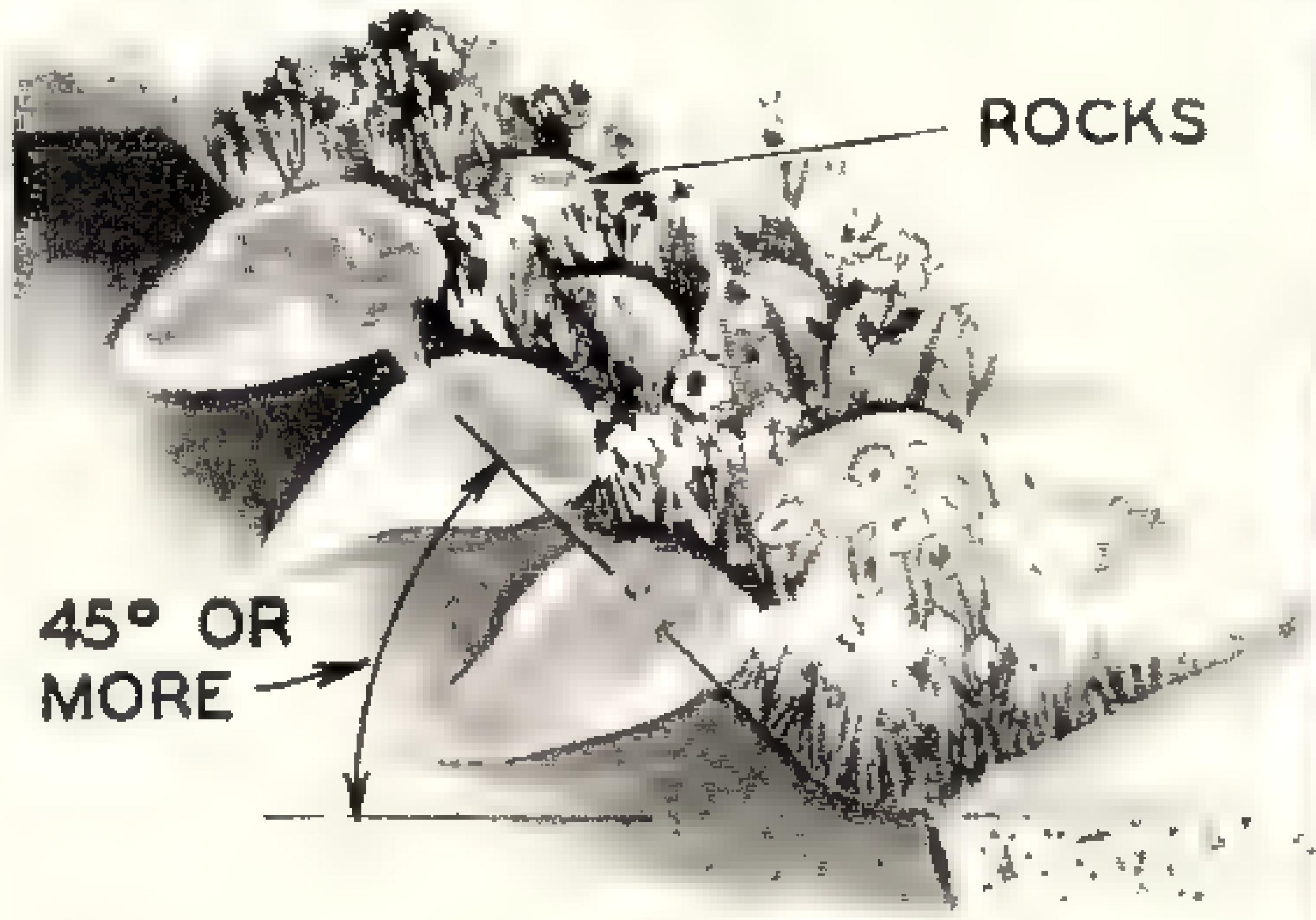
TIPS for the HOME GARDENER

EVERY amateur gardener has been confronted with at least one of the problems solved here, such as the burden of caring for the lawn after the spring enthusiasm fades. An old-fashioned flower garden, once established, does not require exacting care. You may have old trees whose foliage is spindly—feed it vitamins through drain tile, or water through a perforated pipe that reaches the deeper roots. The seed trencher is easy to make, and the sweet-pea trellis a great convenience. Tomato vines produce a surprising crop when started right in youth. And that dried out and trampled terrace can be greatly improved with a rock garden.

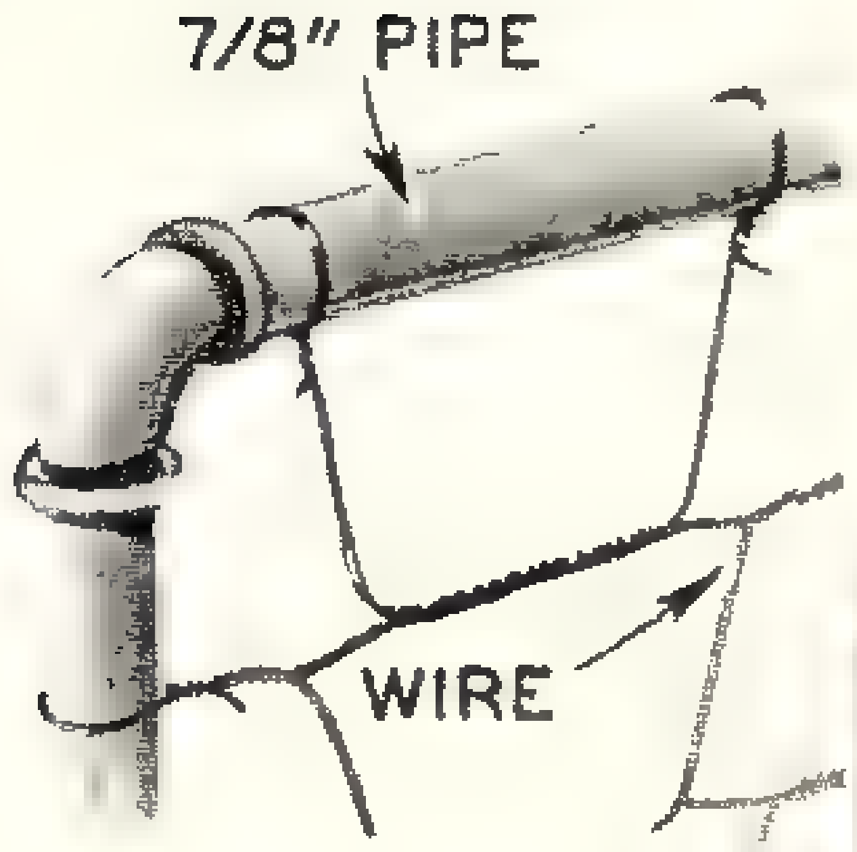
A simple rack will support the tomato vines when they are heavily laden with fruit. Any scrap lumber will be satisfactory. A coat or two of paint will make its appearance much more pleasing.



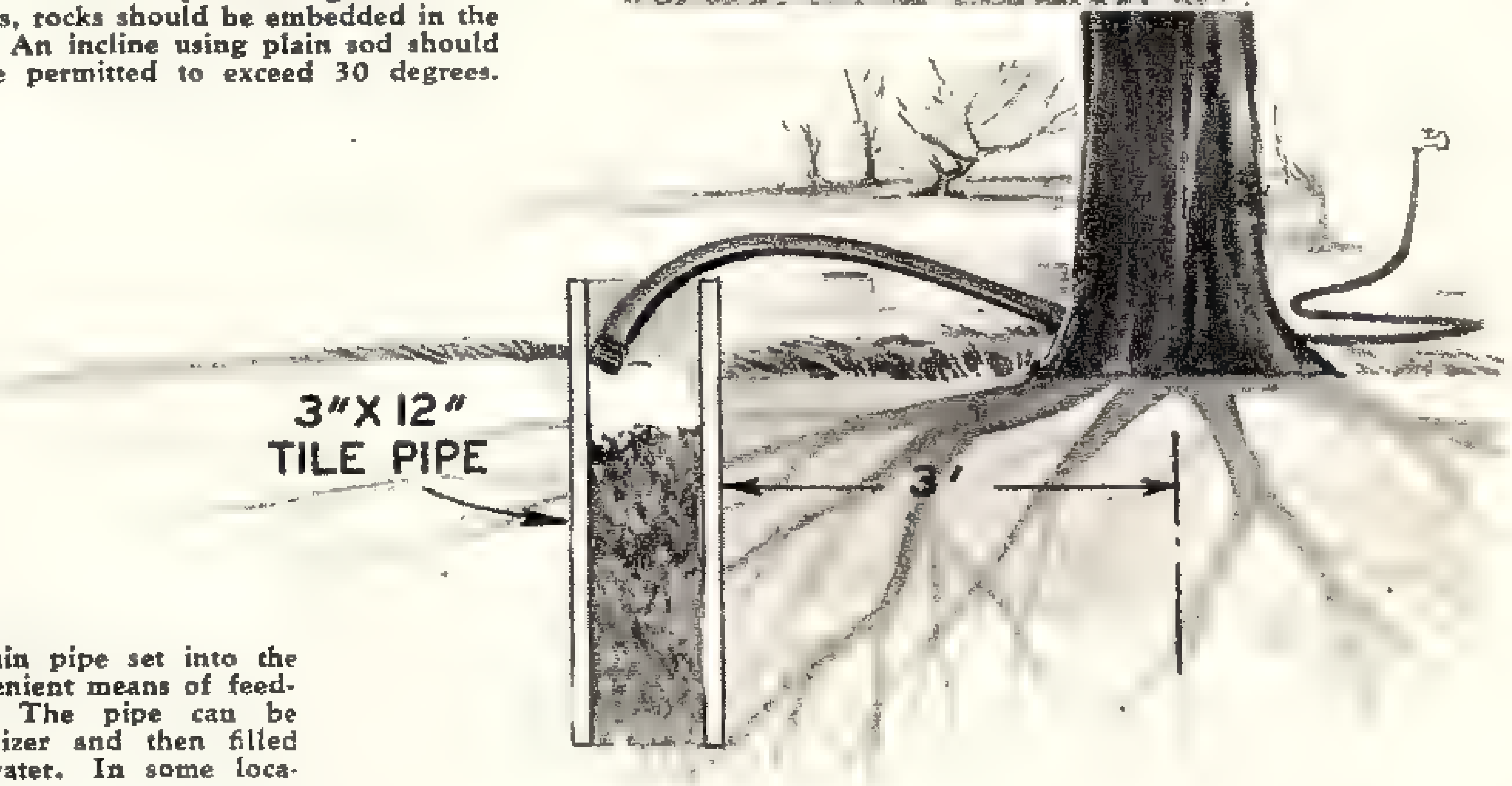
To insure a good tomato crop, fertilize the seedlings generously so that they will become tall and spindly. Scoop out earth at one side and bend the stem down into cavity and cover it with earth to within a short distance of the end.



When a drain slope is as great as 45 degrees, rocks should be embedded in the earth. An incline using plain sod should not be permitted to exceed 30 degrees.



This sweet-pea trellis of galvanized pipe and wire can be pulled up and moved to a new spot each season. When the vines have withered the trellis can be pulled up and stored to make room for any other plants.



A three-inch drain pipe set into the ground is a convenient means of feeding tree roots. The pipe can be filled with fertilizer and then filled regularly with water. In some locations this is the only way trees can obtain sufficient moisture to exist.

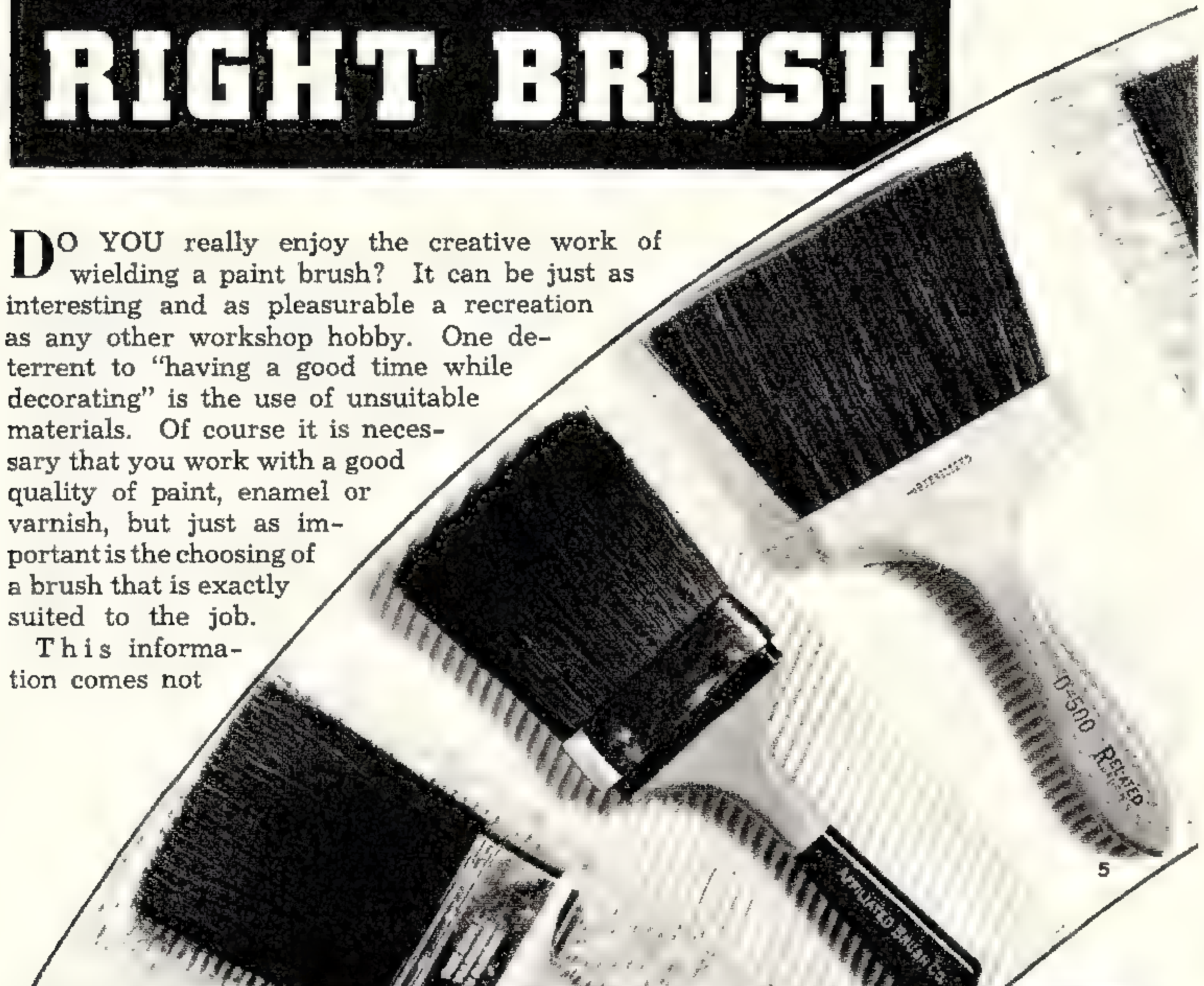
CHOOSE THE RIGHT BRUSH

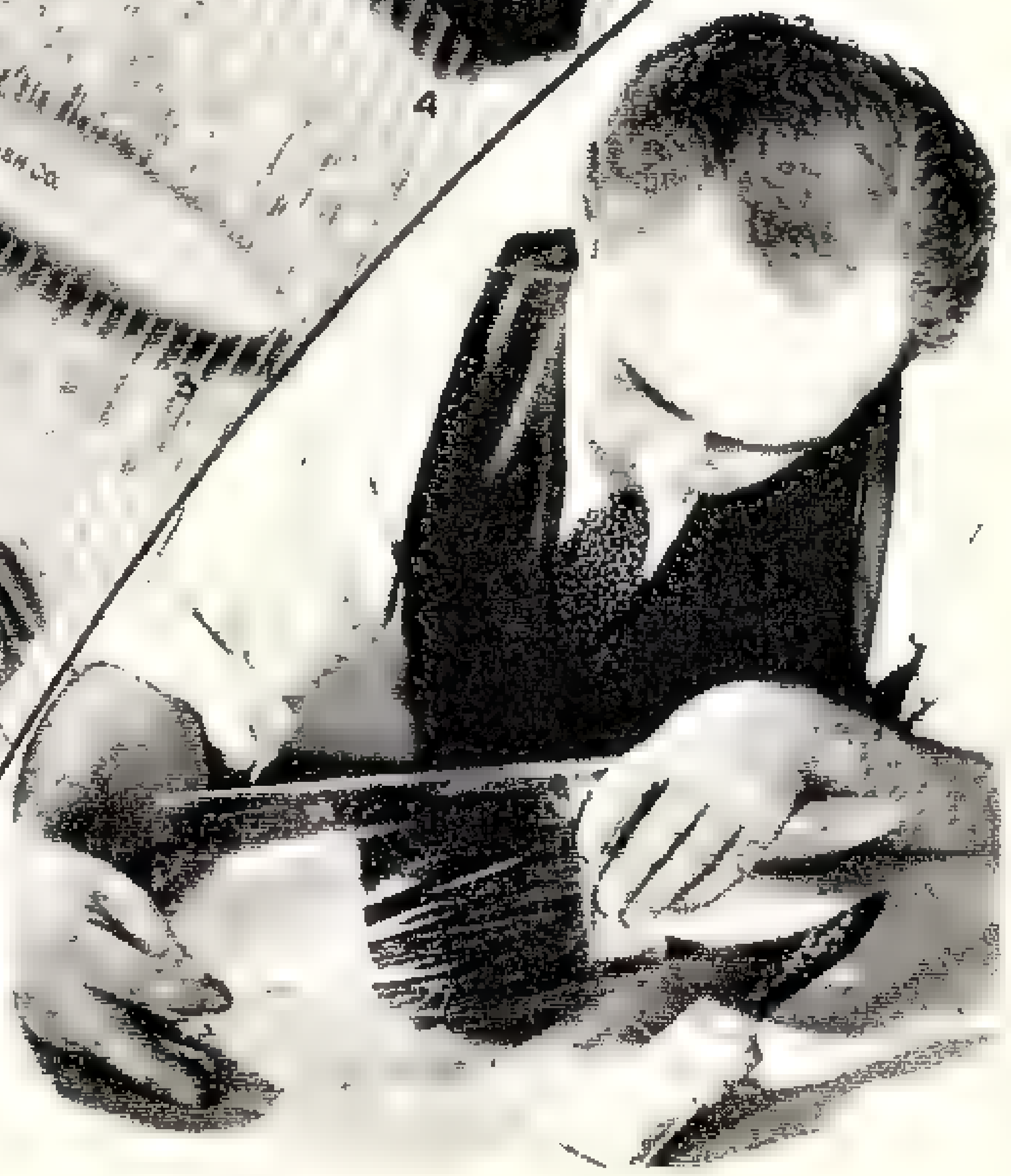
DO YOU really enjoy the creative work of wielding a paint brush? It can be just as interesting and as pleasurable a recreation as any other workshop hobby. One deterrent to "having a good time while decorating" is the use of unsuitable materials. Of course it is necessary that you work with a good quality of paint, enamel or varnish, but just as important is the choosing of a brush that is exactly suited to the job.

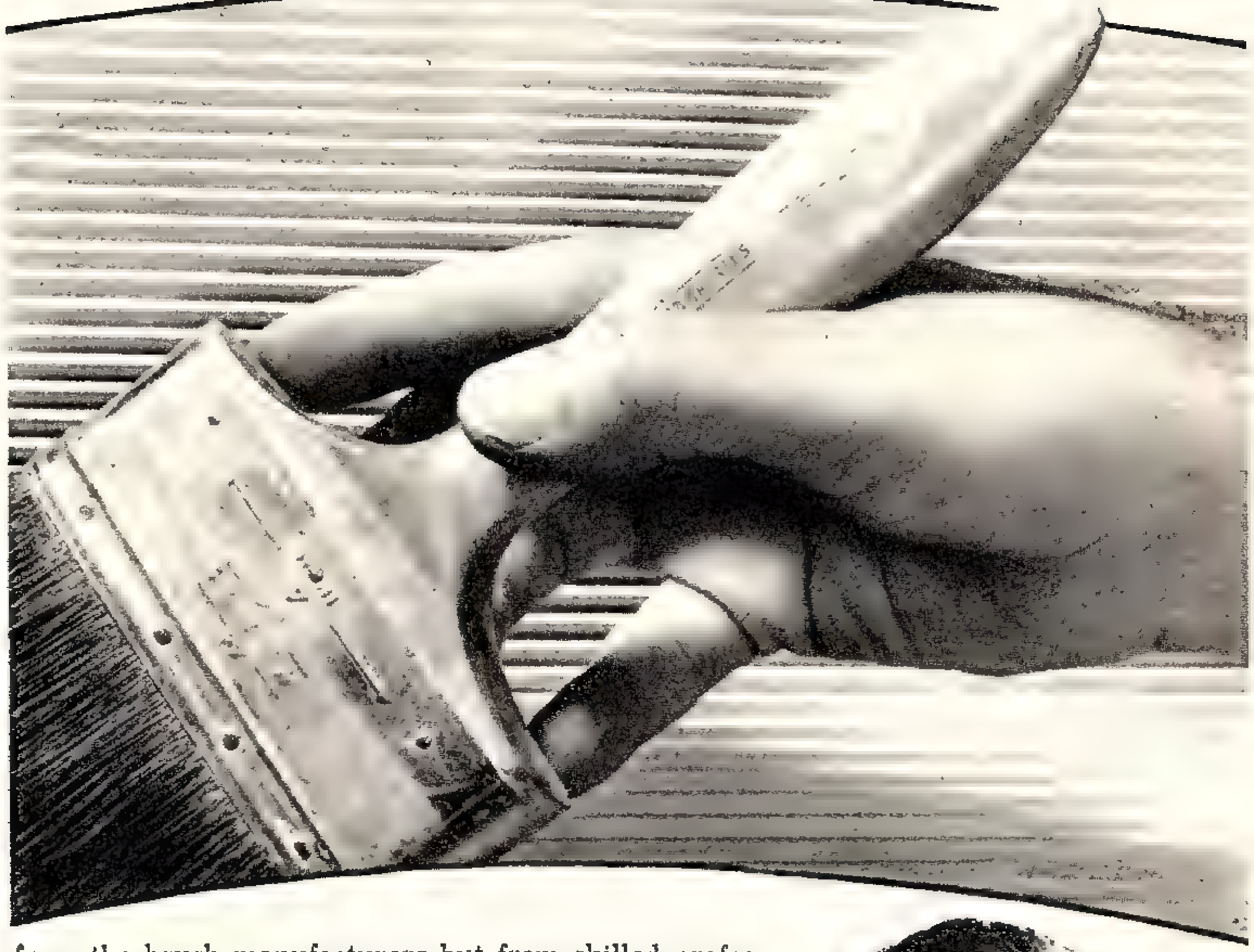
This information comes not from the brush manufacturers but from skilled professional decorators, who know how to turn out first class work because it is a matter of pride and repeat business. First, they say, pay no attention to the size or shape or weight of the handle, nor how the brush balances in your hand. If it is of a reliable make, the manufacturer has provided a handle that is adequate in all respects. The important part to examine is the bristles.

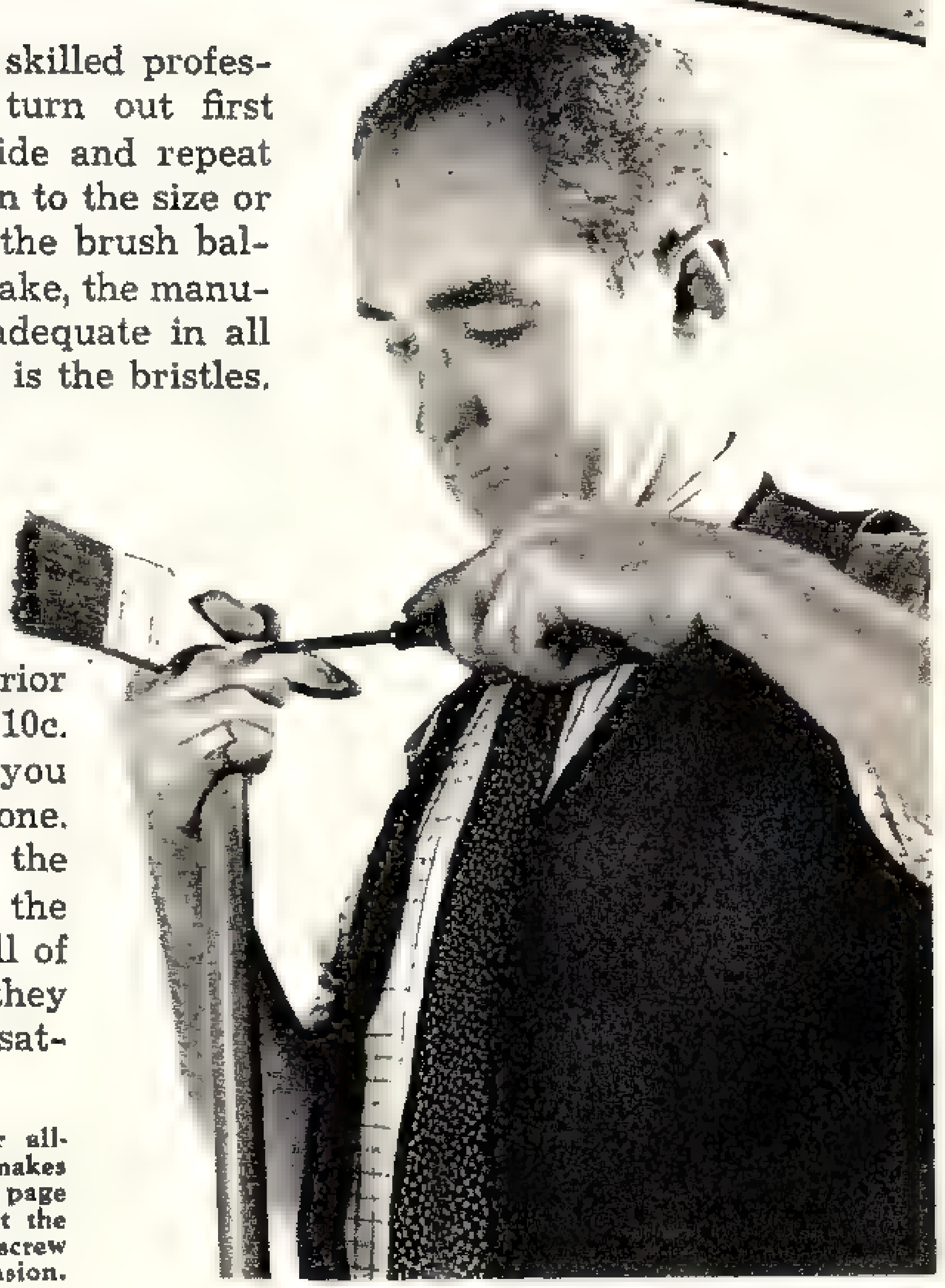
You will not find good bristles in cheap brushes. Master decorators consider it a worthwhile investment to pay up to $5.00 (and sometimes three times that amount) for a brush with which to do their best class of work, so it is to be expected that only very inferior work can be done with one purchased for 10c. A good rule is to use as fine a brush as you can afford for the quality of work to be done.

With practically all types of brushes the quality is dependent on two points: first, the bristles should be springy, elastic and full of life. They will not spread paint well if they are coarse and stiff, and are likewise unsat-









Opposite page—Several types of brushes needed for all-around house painting. Left—A sheet of cellophane makes an excellent moisture-proof holder for a brush. Top of page—The correct way to hold a brush. Right—To paint the inside of a narrow space where the hand can not reach, screw an old brush to the end of a broom handle as an extension.

A new brush can be tested for stiffness by pressing it against the back of the hand. The bristles should be springy and full of life.

Close inspection of brush bristles quickly reveals the presence or lack of "flag ends." Their presence is an indication of quality.

isfactory if they can be bent in any direction without resistance. Secondly, examine the ends of the bristles by fanning them out between the fingers. If each is well "flagged," or split into two or more smaller branches, they will do good work. The flag ends will enable the brush to hold more paint and will spread it out better.

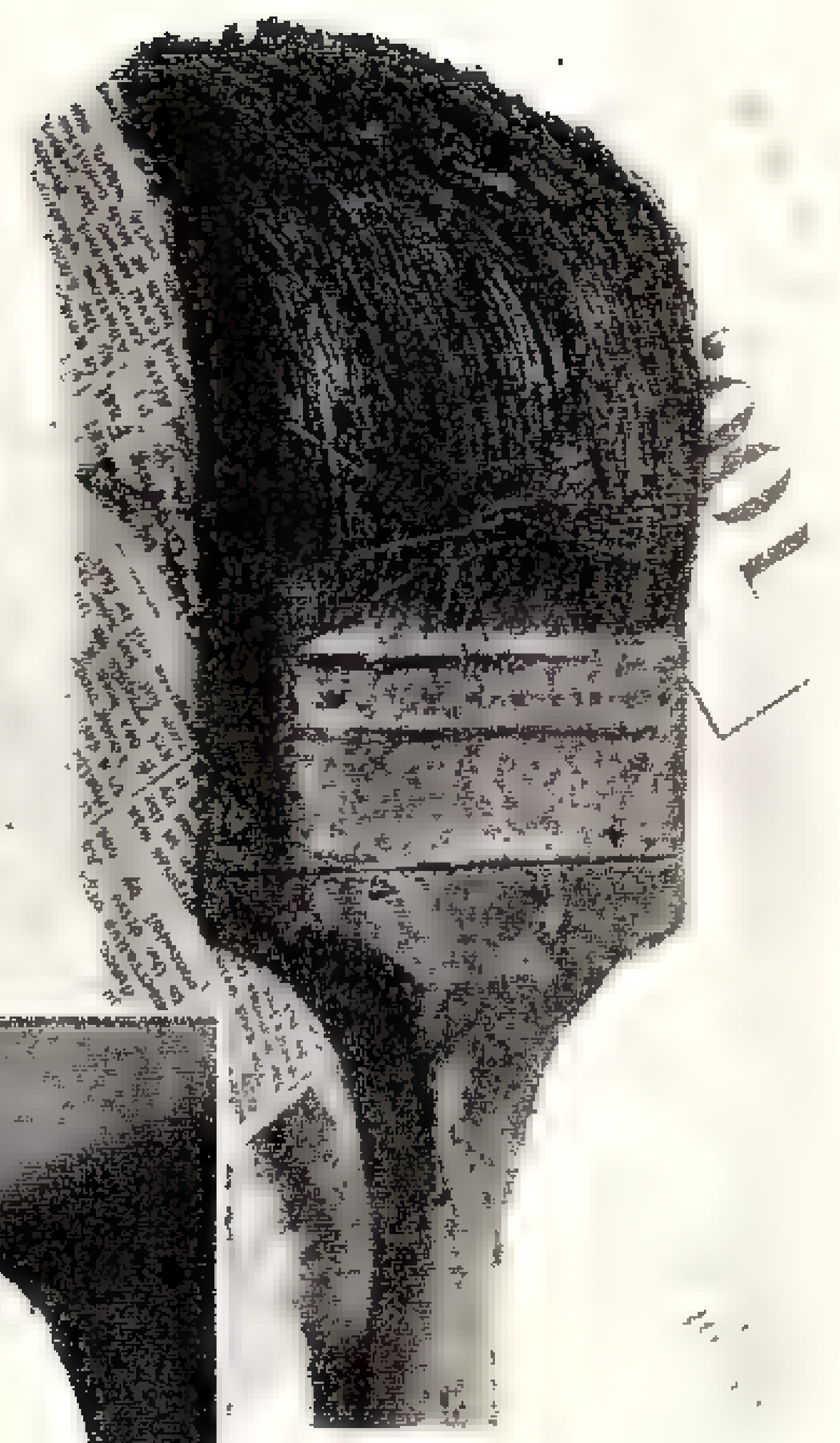
Choose a brush of the correct size and type for the work you wish to do. If you are not sure about the one to use ask the dealer. The bristles should not be too thin or scanty. While a narrow brush is desirable for narrow work, it may leave markings when brushing out the paint on a wide surface. The length of the bristles is important and the longer they are, the better the brush. Then notice whether the bristles are set in glue, rubber or cement.

If the brush is of good quality, either of the three types will be satisfactory for its purpose, but with a cheap brush the setting will allow occasional bristles to loosen throughout its life. A glue-set brush will not be satisfactory if it is to be put in water, while one set with cement should never be used with a finish containing alcohol, such as shellac, or in the more volatile solvents such as are contained in quick-drying lacquer and lacquer thinners. The rubber-set brush may be used for all around purposes and will prove most generally suitable. There may be a few loose bristles in the new brush, even of good quality, and it is a good practice to flick them out beforehand by slapping the bristles across your fingers a number of times. If trouble from loose bristles is experienced later, it may be due to lack of care in cleaning and preservation.

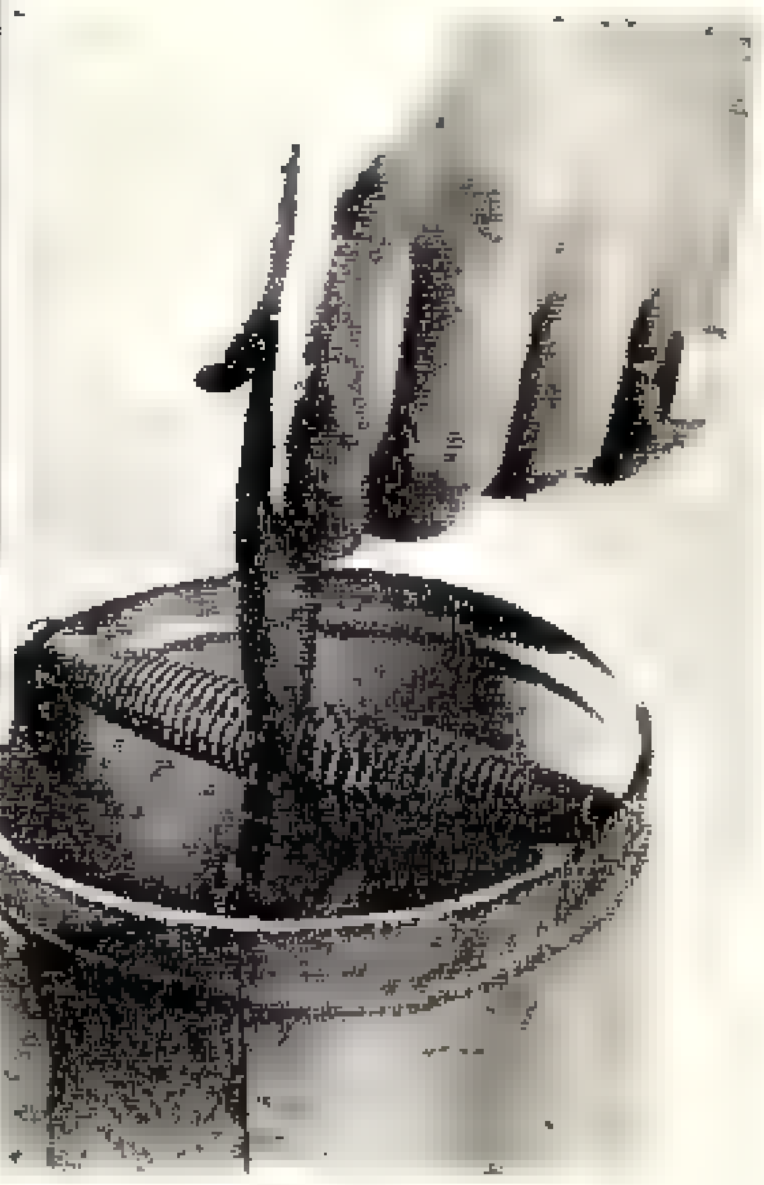
For outside painting jobs most master painters use flat brushes in several widths, with black Chinese bristles set in rubber. For general work you will need one three or four-inches wide, and for sashes and trimming a narrower one with a longer handle (known as a trim brush), either round or oval so that it will carry more paint. With these, as well as with brushes for interior work, you should have a flat duster about four inches wide to clean up the work ahead of the paint brush. While a duster is not absolutely necessary, the quality of your work will be greatly improved.

For enamel and varnish some painters use a good grade of black Chinese bristles, but when questioned they usually admit that for particular work their preference turns to a soft flowing Fitch brush. Bear and ox hair also come in the latter class. While for ordinary painting you will use a square-end brush, varnish and enamels should be flowed on, and for this reason the chisel end is usually chosen. For ordinary work use one about three inches wide, and if possible have on hand smaller brushes for narrow work and trimming. For walls select a four-inch Chinese bristle; floor can be handled nicely with a two and one-half-inch flat or oval, the latter being given the preference. In general, use a brush to suit the size of the surface to be finished, and do not try to use

[*Continued on page* 132]



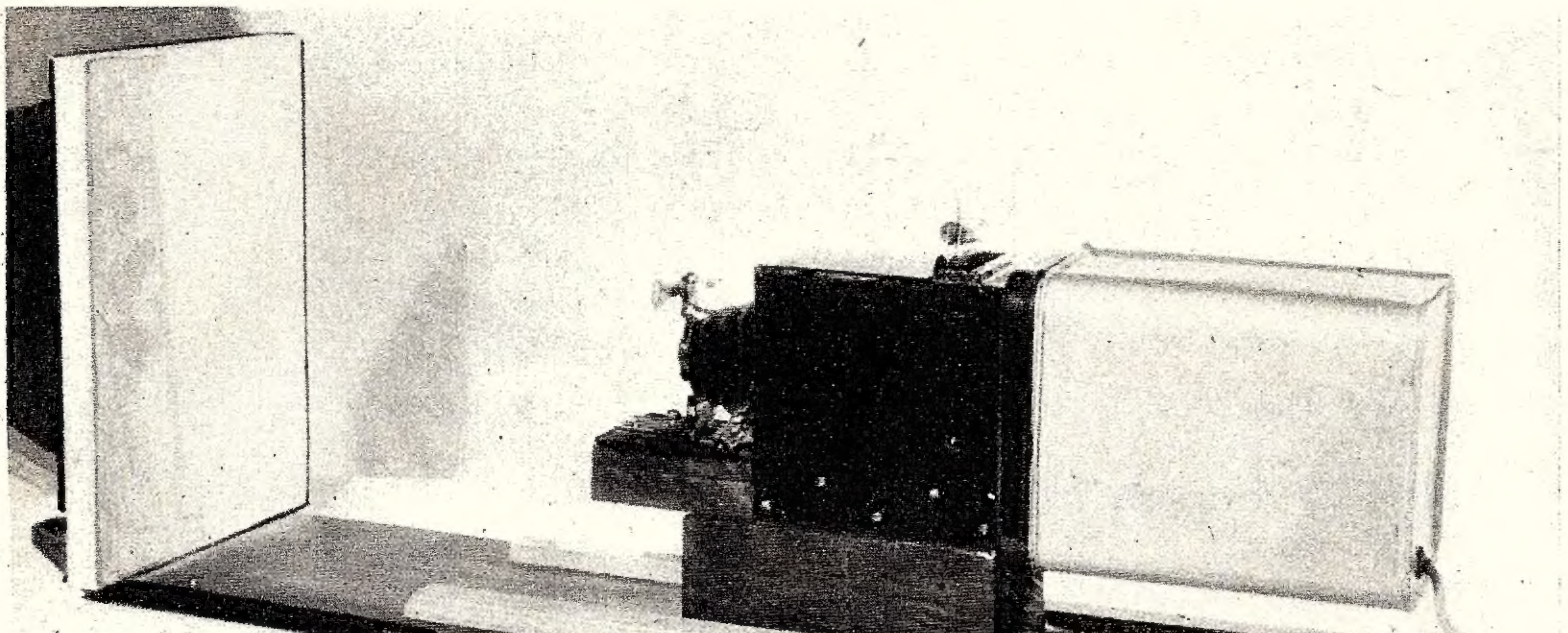
Above—Use a coarse comb to work the cleaner deep into the heel so that every trace of paint is removed. Above right—The result of improper cleaning and care of what was a good brush.



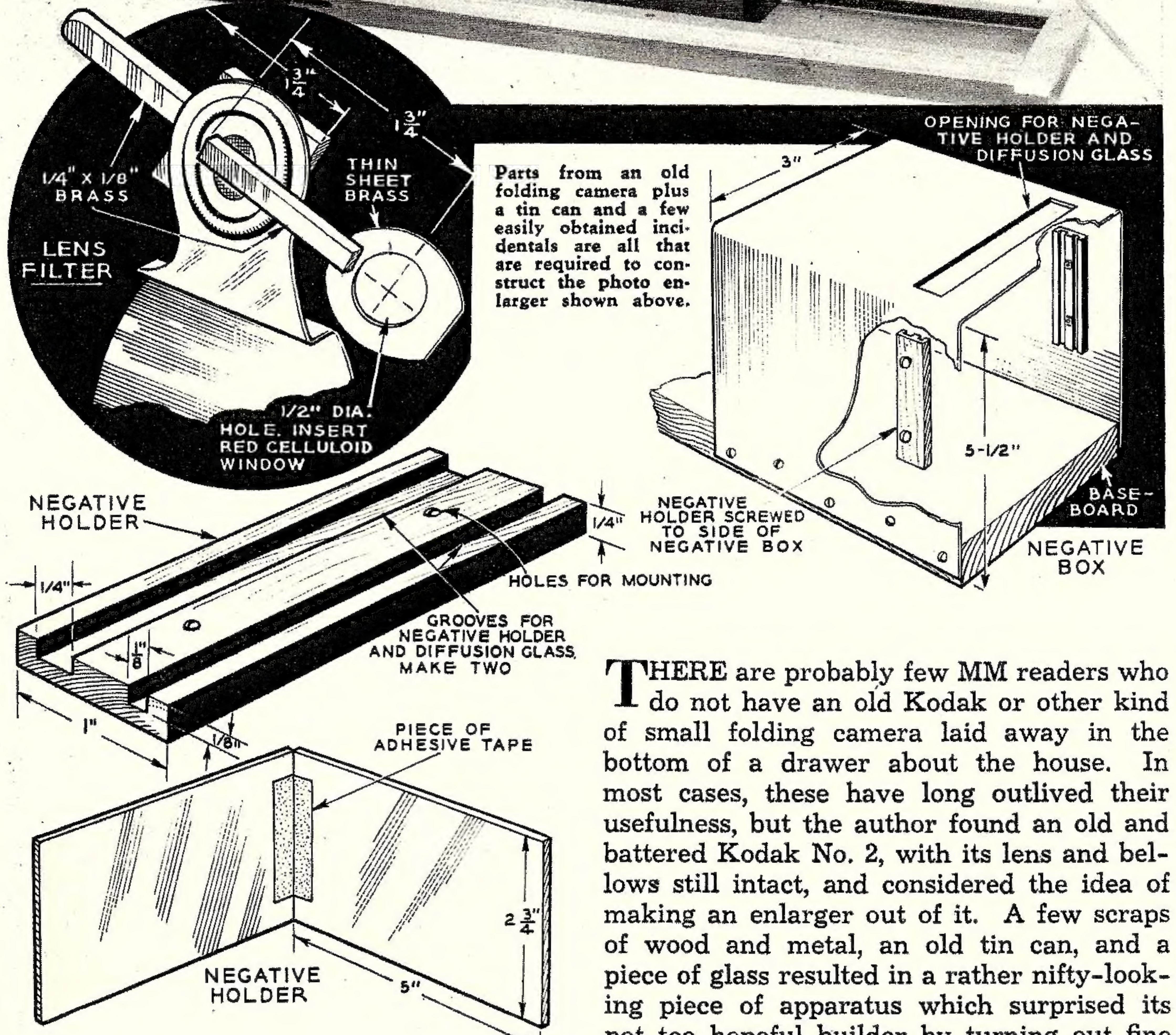
Cleaning a brush immediately after using it will keep it in first class condition for years. Below—A large coil spring will hold the tip of the brush in the paint.

THE "TIN CAN SPECIAL"

A Practical Photo Enlarger



Parts from an old folding camera plus a tin can and a few easily obtained incidentals are all that are required to construct the photo enlarger shown above.


1 3/4"
1 3/4"
1/4" X 1/8" BRASS
THIN SHEET BRASS
LENS FILTER
1/2" DIA. HOLE. INSERT RED CELLULOID WINDOW
OPENING FOR NEGATIVE HOLDER AND DIFFUSION GLASS
3"
5-1/2"
BASE-BOARD
NEGATIVE BOX
NEGATIVE HOLDER SCREWED TO SIDE OF NEGATIVE BOX
NEGATIVE HOLDER
1/4"
1/4"
HOLES FOR MOUNTING
GROOVES FOR NEGATIVE HOLDER AND DIFFUSION GLASS. MAKE TWO
1/8"
1"
1/8"
PIECE OF ADHESIVE TAPE
2 3/4"
5"
NEGATIVE HOLDER

The view finder of the camera provides a mounting for the enlarger's lens-filter (top sketch), construction of which is described in text. Center sketch—Construction details of the grooved blocks, which accommodate the negative holder and diffusion glass, as shown in sketch at top right. Two pieces of hinged negative glass comprise holder (above).

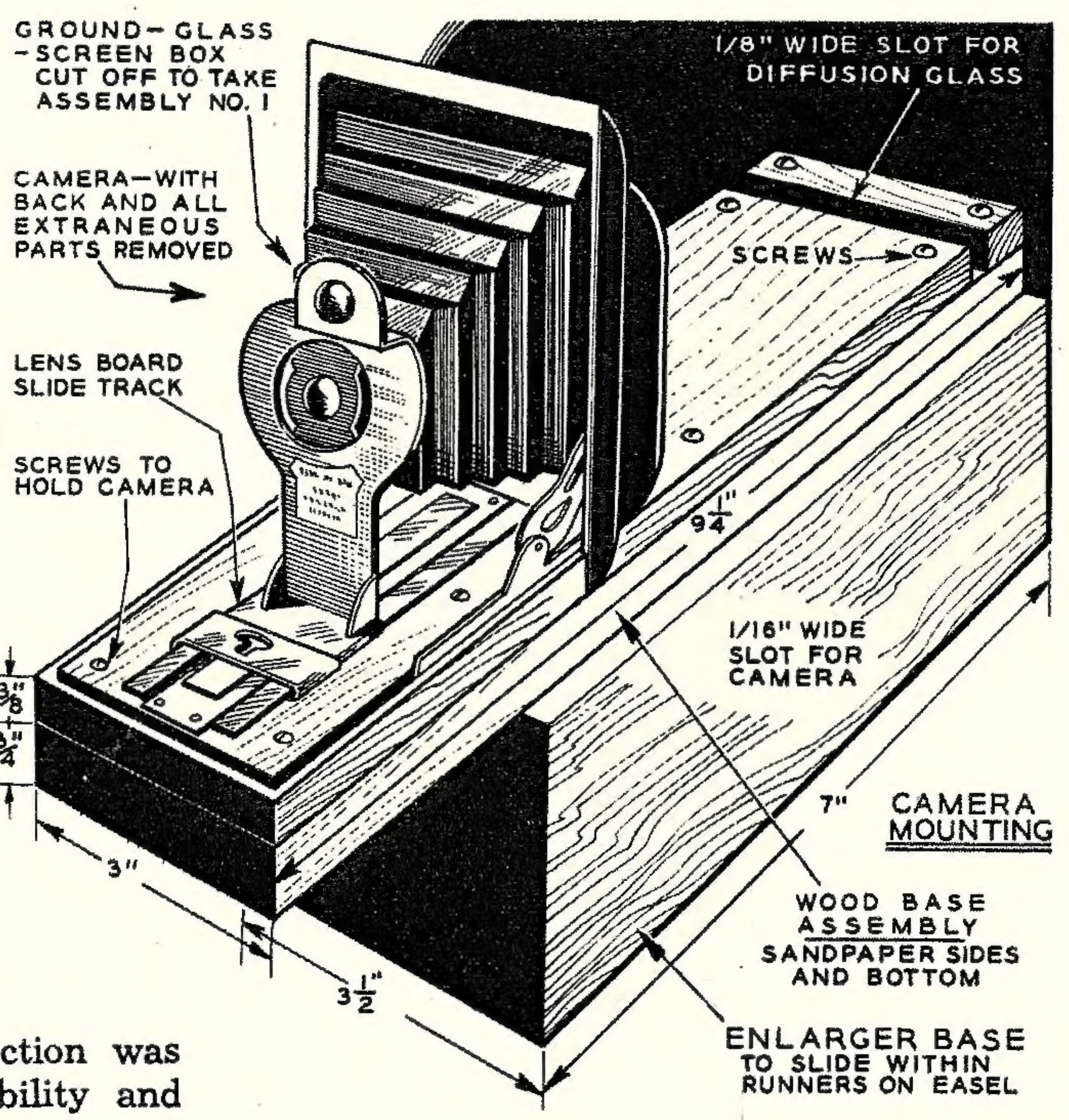
THERE are probably few MM readers who do not have an old Kodak or other kind of small folding camera laid away in the bottom of a drawer about the house. In most cases, these have long outlived their usefulness, but the author found an old and battered Kodak No. 2, with its lens and bellows still intact, and considered the idea of making an enlarger out of it. A few scraps of wood and metal, an old tin can, and a piece of glass resulted in a rather nifty-looking piece of apparatus which surprised its not too hopeful builder by turning out fine 8″x10″ prints from negatives as small as those used in the popular miniature cameras.

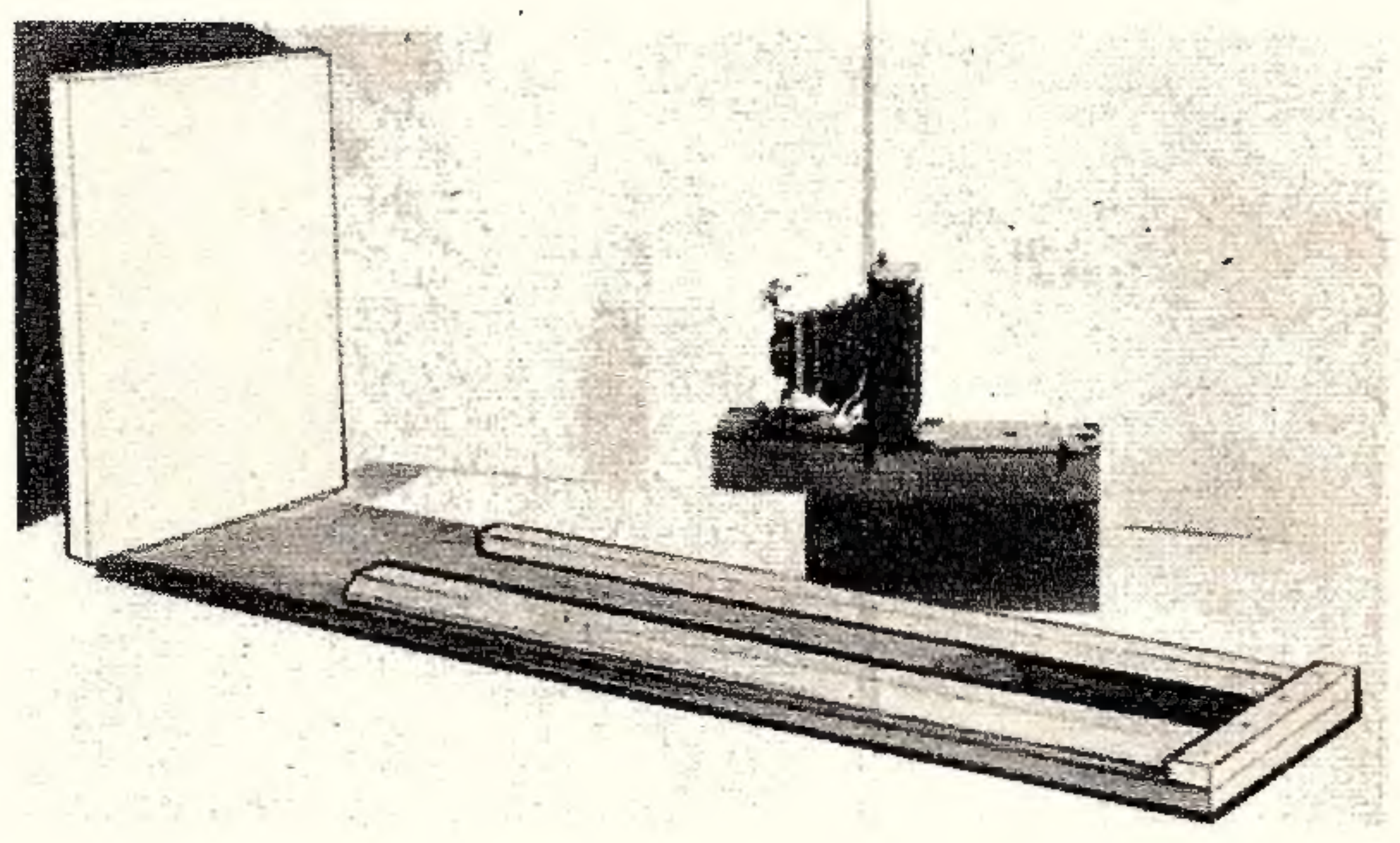
With a photoflood as a light source, the printing time of the home-built enlarger is as fast as that of commercial enlargers with much faster lenses, while the quality of the prints leaves little to be desired. When one considers that a mechanically flexible and rugged job can be made for a ridiculously small amount of money and work, there seems to be no reason why any camera enthusiast should not make his or her own enlargements.

The horizontal type of construction was used because of its inherent stability and simplicity. In the instructions that follow, it should be remembered that the dimensions given in the drawings are for the Kodak No. 2 folding camera. The necessary modifications for a camera of different size can be readily made.

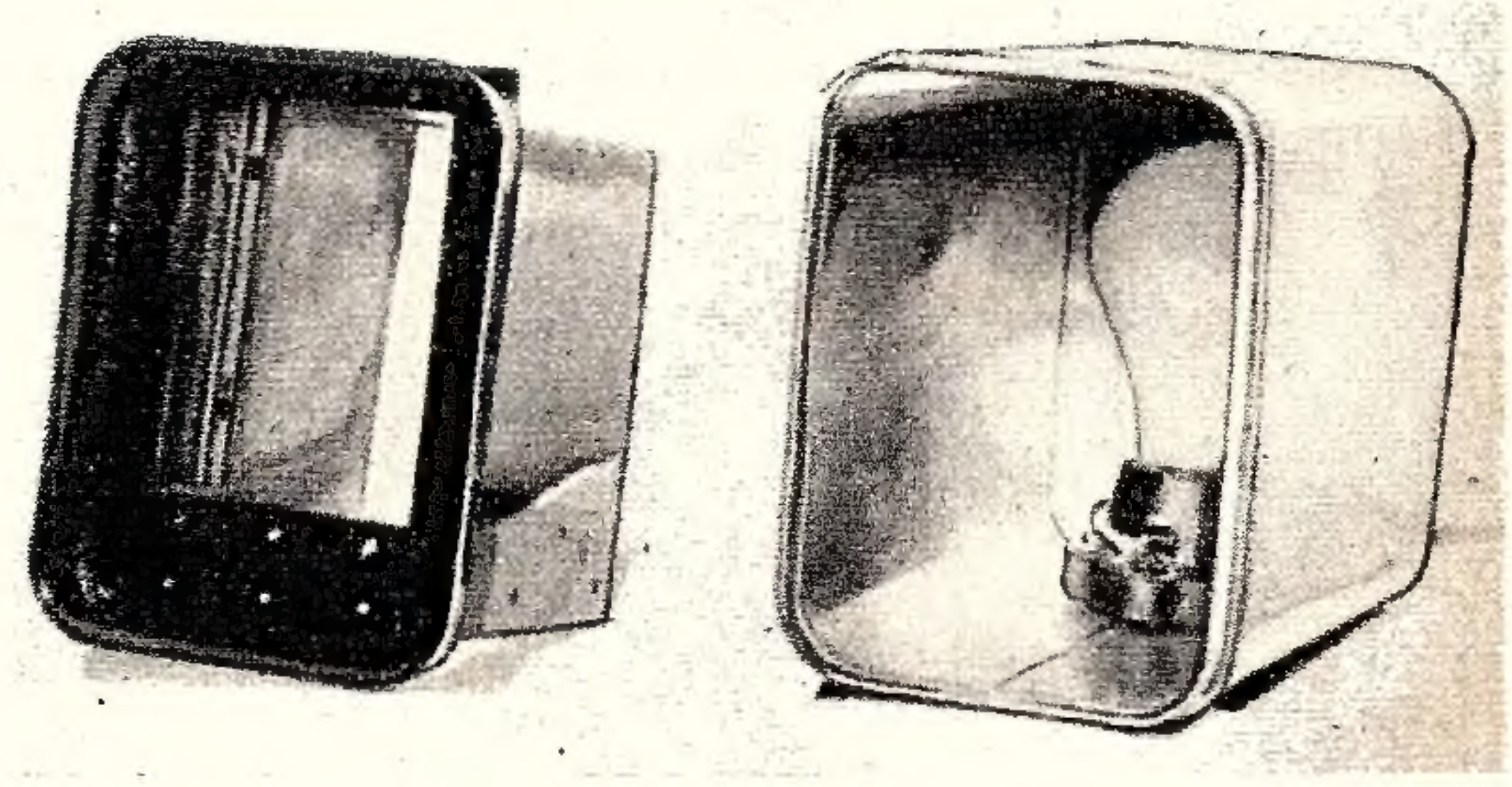
Some minor "operations" are necessary on the camera itself. The back of the camera is removed and can be discarded, since it is not used in the enlarger. Make sure, however, to salvage the little red celluloid window, as it will be useful in making the lens filter, which is placed before the lens when sizing the image on the printing paper. The camera should now be opened, and all extraneous parts removed from the base. This includes the distance scale, the tripod socket, the closing catch, and all miscellaneous rivets and screws except those which hold down the track on which the lens mount slides. Drill four holes, one in each corner of the base, for holding down the camera. Wood screws are driven through these holes into the wooden baseboard assembly, as sketched above. The bottom block of this assembly should be sand-papered on its sides and bottom, since it slides on the enlarger base, as the photographs and sketches show. The total height of this whole assembly is such that the lens is on a direct line with the center of the easel.

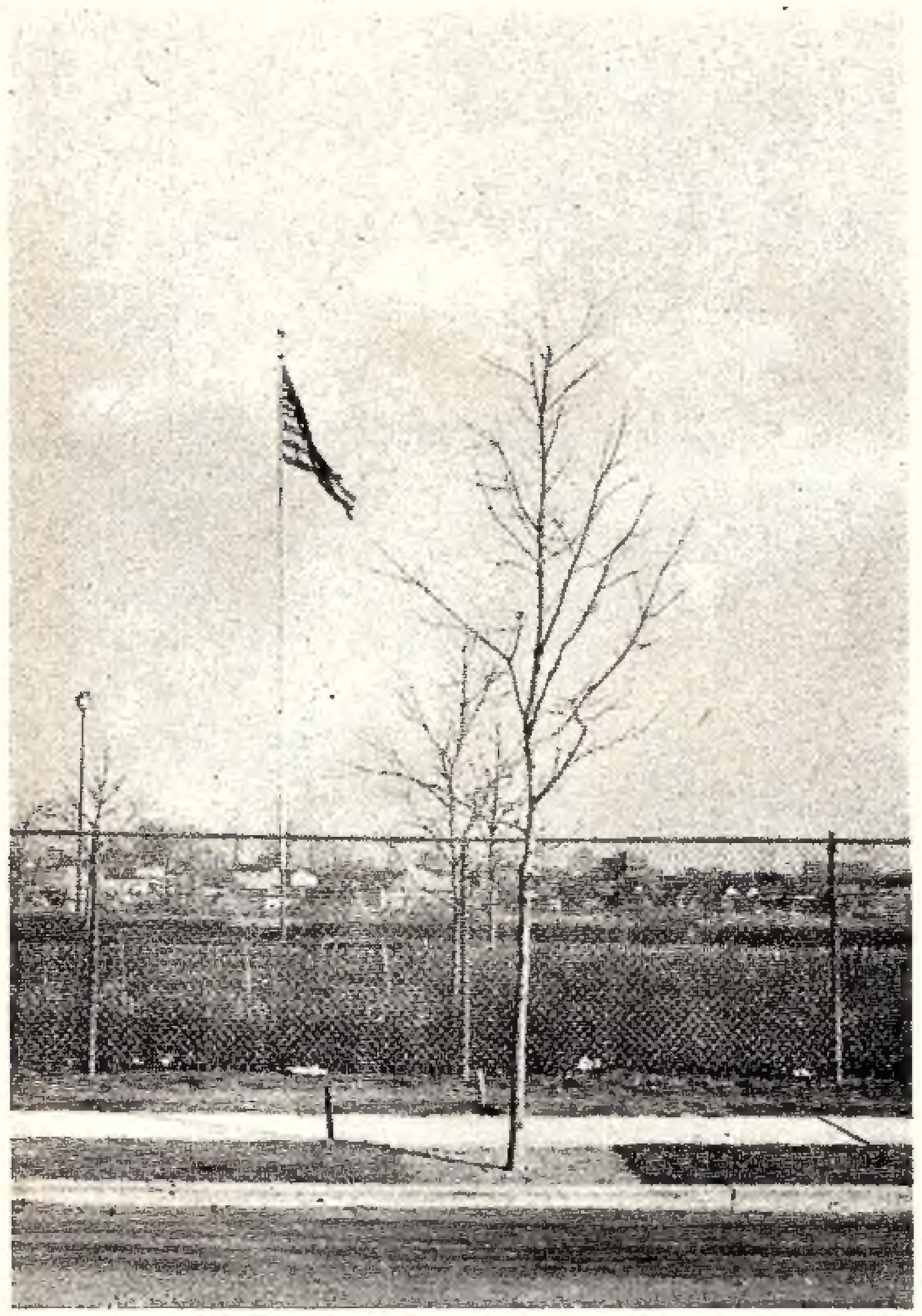
The view-finder on the camera provides a convenient mounting for the lens-filter, since it can be swung around in and out of position. The small right-angular box holding the ground-glass screen is sawed off flush and then filed clean. Short lengths of brass rod are then soldered on the screw and nut


GROUND-GLASS -SCREEN BOX CUT OFF TO TAXE ASSEMBLY NO. 1
CAMERA—WITH BACK AND ALL EXTRANEOUS PARTS REMOVED
LENS BOARD SLIDE TRACK
SCREWS TO HOLD CAMERA
3/8"
3/4"
3"
3 1/2"
1/8" WIDE SLOT FOR DIFFUSION GLASS
SCREWS
9 1/4"
1/16" WIDE SLOT FOR CAMERA
7"
CAMERA MOUNTING
WOOD BASE ASSEMBLY SANDPAPER SIDES AND BOTTOM
ENLARGER BASE TO SLIDE WITHIN RUNNERS ON EASEL



The sketch at top of page shows complete details of the camera mounting on the wooden assembly base. Above—Completed easel and enlarger baseboard with camera mounting slide-guides. A tin can serves as lamp housing for enlarger (below).



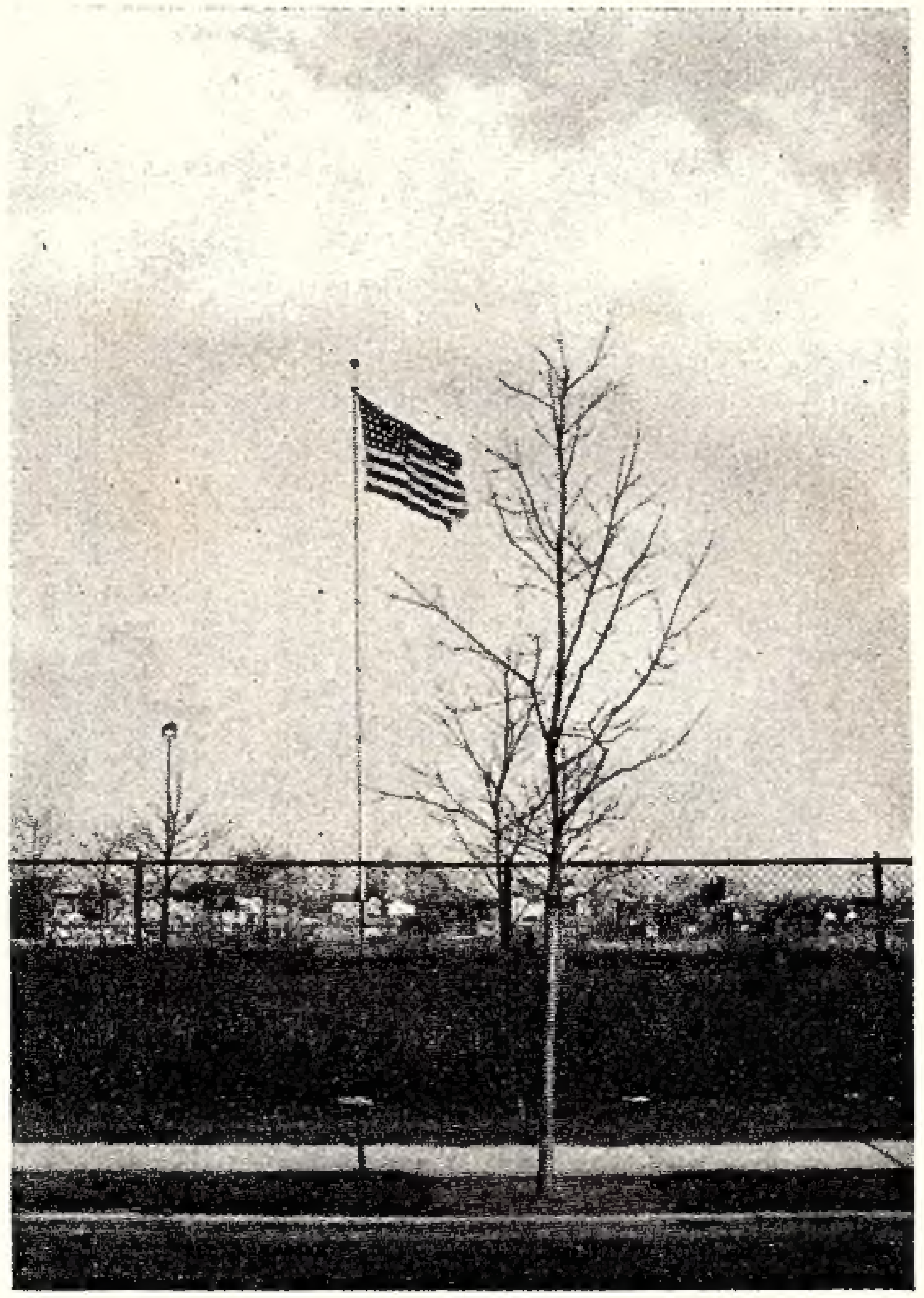


These three pictures graphically show the value of lens filters. The view above was taken on a dull day with regular super-sensitive panchromatic film, 1/50 second at f.14, without a filter. The heavy clouds in the sky are barely perceptible.

Films of the "pan" type ("panchromatic") respond to the entire visible spectrum, from the ultra-violet up to and including red, and therefore they register red objects as gray tones of varying depth; also, they must be opened only in complete darkness, as no "safelight" is longer "safe" for them. However, regardless of the type of film, they still are most sensitive to the ultra-violet, violet and blue. Sky light is especially rich in these colors, a fact to be kept in mind.

Photographers use cameras to make permanent records of what their eyes see, but unfortunately, the color sensitivity of the human eye does not coincide with that of films. The eye is most sensitive to green, less responsive to blue and violet, and totally blind to ultra-violet. Thus, a landscape that appears gorgeous to the eye because of rich green foliage and blue sky turns out to be a very disappointing photograph when made on ordinary film. In the black and white print the trees and grass look too dark, the sky too light. This is easy to understand now, because we know that the ultra-violet, violet and blue light of the sky registered much more strongly than the green of the fields, throwing the photographic picture entirely out of balance with the visual picture. To restore this balance, we must restrain the powerful blue rays without affecting the other colors; for this purpose we put a piece of colored glass or other transparent substance in front of the camera lens, and we call this attachment a "filter."

The name fully describes the action. Light rays of any desired color are allowed to pass through to the camera, while others are entirely or partially absorbed, and therefore have no effect on the film. There are dozens of different shades of filters, intended for specific applications in many photographic fields, and their study is an extremely interesting one for the advanced experimenter. For the amateur, however, one, two or at the most three filters will take care of all ordinary requirements in pictorial and landscape work.



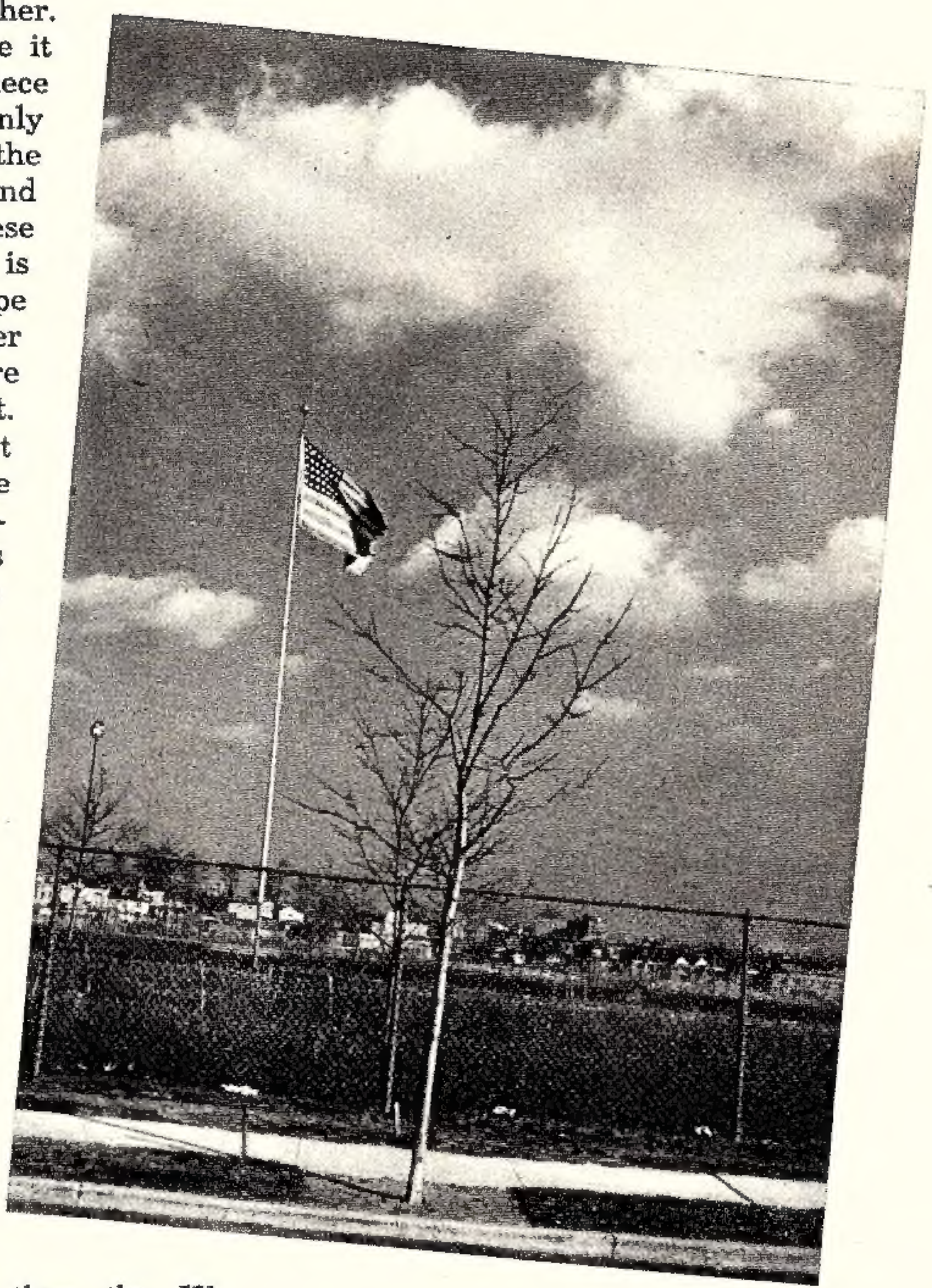
This is the same scene, taken a few seconds later with a K2 yellow filter, 1/50 second at f.11. The clouds now show fairly well.

Any object will appear colored if by its nature it eliminates one or more of the components of white light. Grass appears green, for instance, not because it reflects green but because it absorbs blue on one side of the spectrum and red on the other. A red filter looks red because it absorbs blue and green. A piece of glass which holds back only blue light looks yellow to the eye because it passes red and green, and a mixture of these colors becomes yellow. It is obvious from the landscape problem that a yellow filter would have saved the picture by restraining the sky light.

The yellow filter, in different depths, is unquestionably the most useful of all. It is invaluable for outdoor scenes in which the sky shows prominently, because in restraining the ultra-violet and blue of the actual sky, it makes white clouds stand out beautifully. A yellow filter in many cases means the difference between an ordinary snapshot and a prize-winning salon masterpiece.

The "K1" is a pale yellow filter and is used when a short exposure is more important than a high degree of correction. The "K2" is the most popular and widely used filter in photography, and brings out clouds more definitely than the K1. When used with super-sensitive panchromatic film in daylight, a very close approximation to true orthochromatic rendering of the subject will be obtained; that is, all colors will be registered correctly. It can be used very successfully with any of the "chrome" films. The "G" is a deep yellow "contrast" filter, and cuts through atmospheric haze effectively. It is also useful in providing good contrast between snow and shadows in snow scenes.

The "X1" is a pale green filter designed to give complete color correction with super-X panchromatic and Panatomic film in daylight. Such occasions arise, for instance, with flowers containing a mixture of red, yellow and green. The X1 is also helpful in making photos of a person's face against the sky. Under artificial light, the X1 is used with super-sensitive panchromatic film for complete correction. The X1 cannot be used with other than pan type films.



Still the same scene, but photographed through an "A" red filter, 1/50 second at f.7. The sky looks almost black.

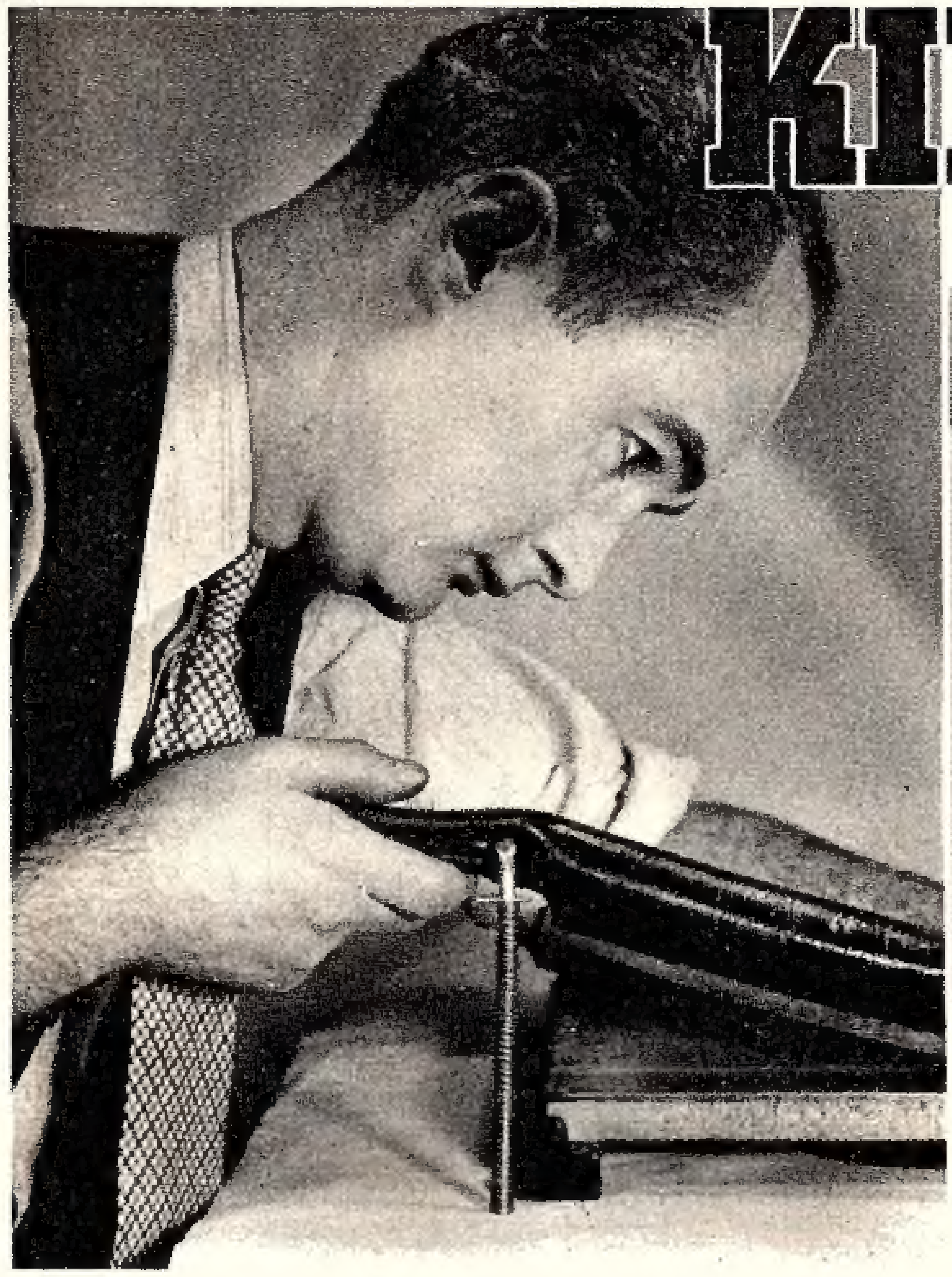
The X2 is a deeper green filter, and is used with super-X and Panatomic films for correct color balance in black and white with artificial light. It has no use with daylight.

The "A" filter is red, and is of special advantage is recording clouds against the sky, making the latter come out almost black. Pictures taken in full sunshine with this filter sometimes have a night-time appearance. Some startling effects can be obtained with this filter if it is used carefully.

A second feature of the use of a yellow filter is the better detail recorded of distant objects. During the summer, distant hills appear somewhat hazy because the haze (which is due to fog-like accumulations of moisture) scatters blue light and tends to blur scenes seen through it. However, it

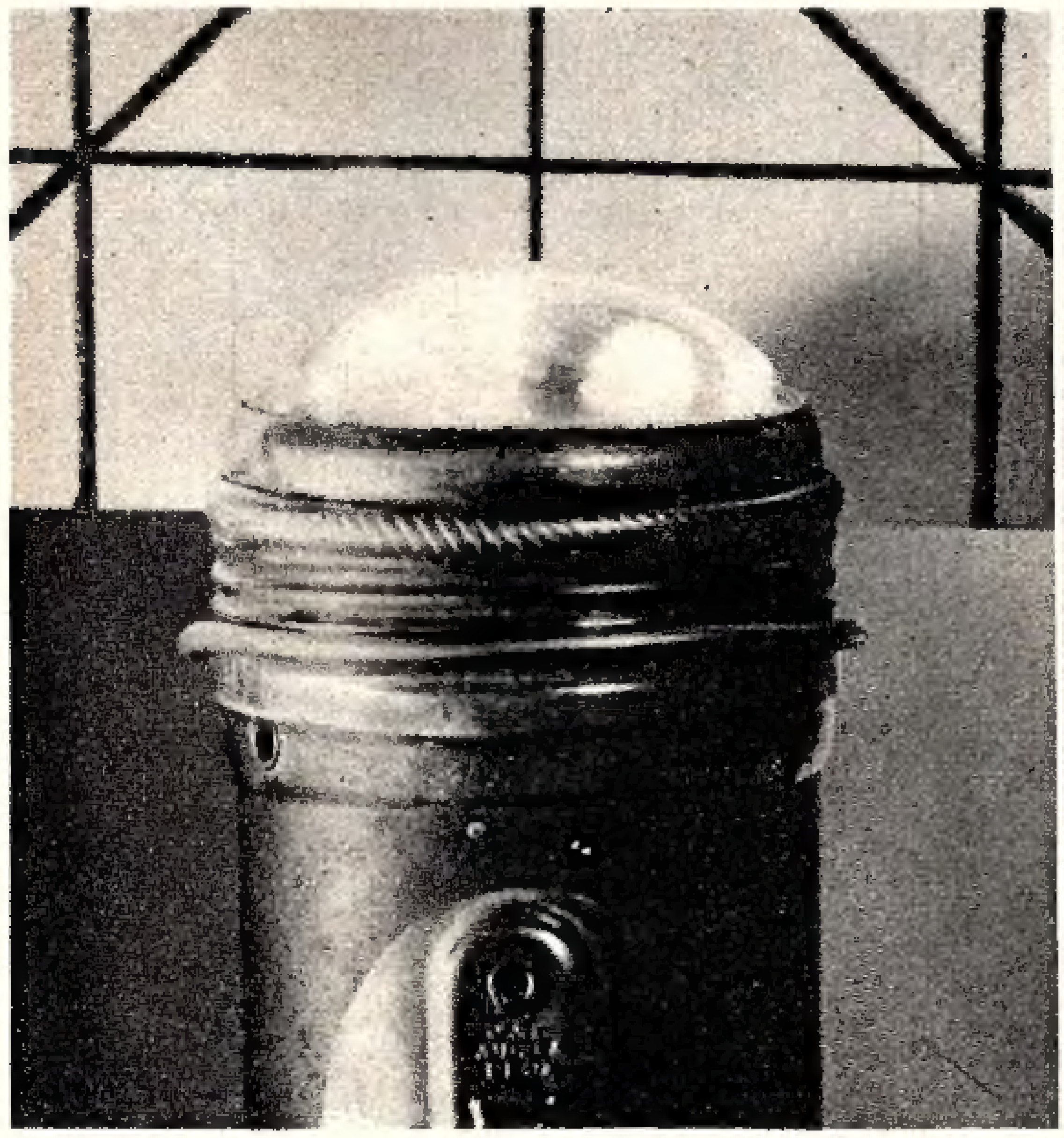
[*Continued on page* 120]

KINKS FOR CAMERA FANS



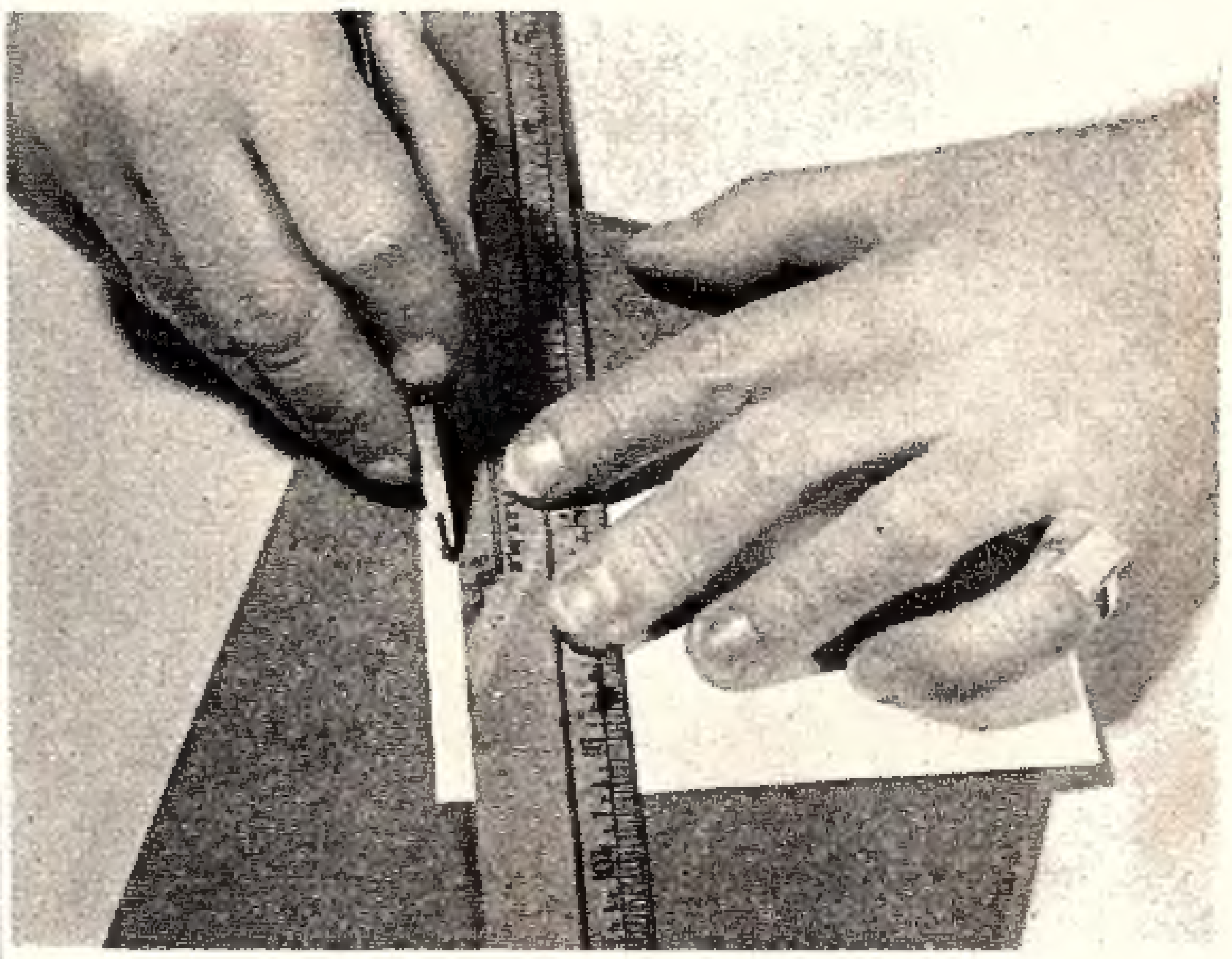
SPRING SPEEDS CUTTER

When trimming prints, the cutter blade action can be speeded up considerably by using a spring to raise the blade, as shown in the photograph.



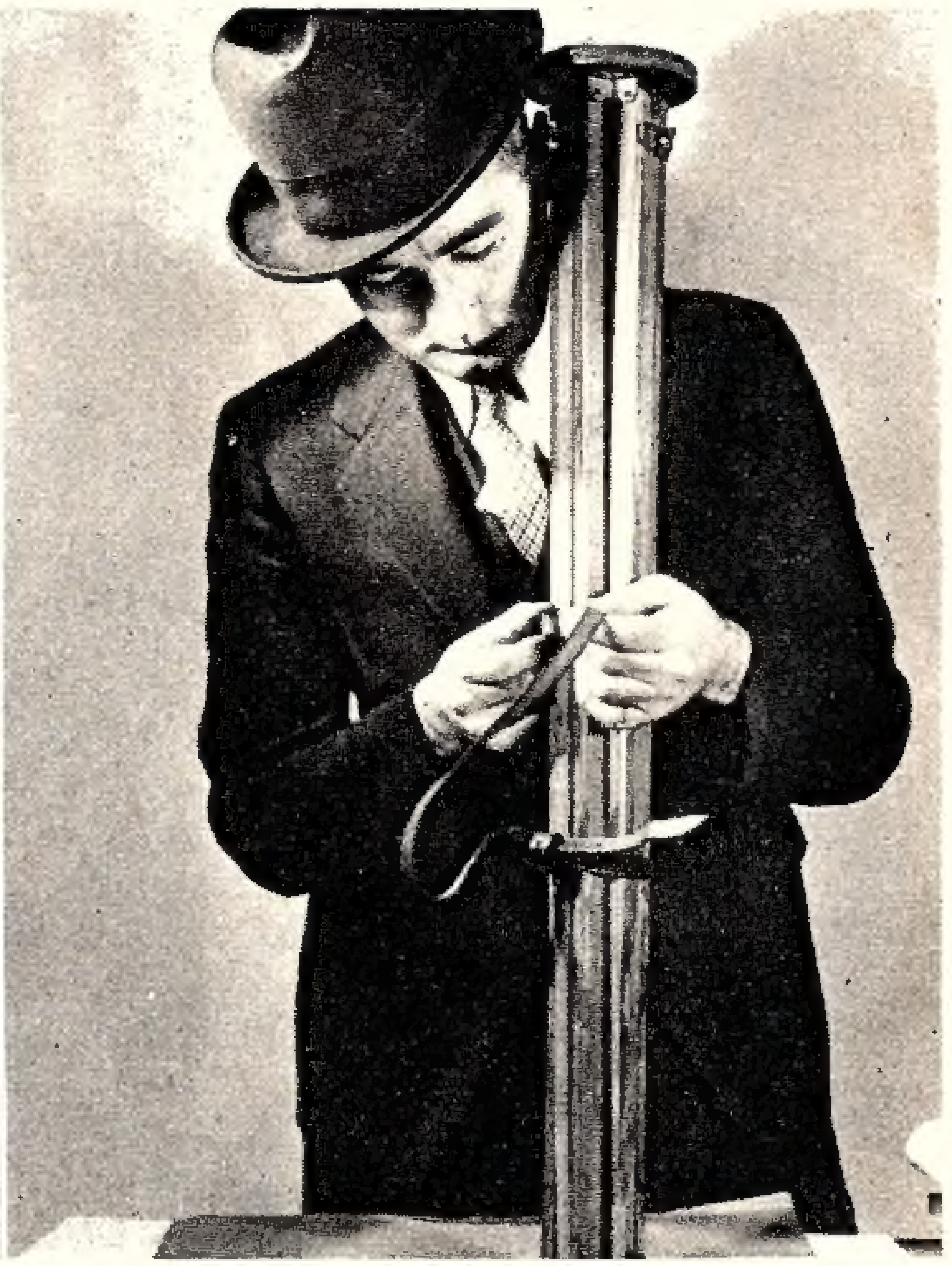
CARD SIMPLIFIES FOCUSING

A white card ruled with black lines as shown in the photograph and attached to a flashlight, simplifies focusing when a ground glass is used.



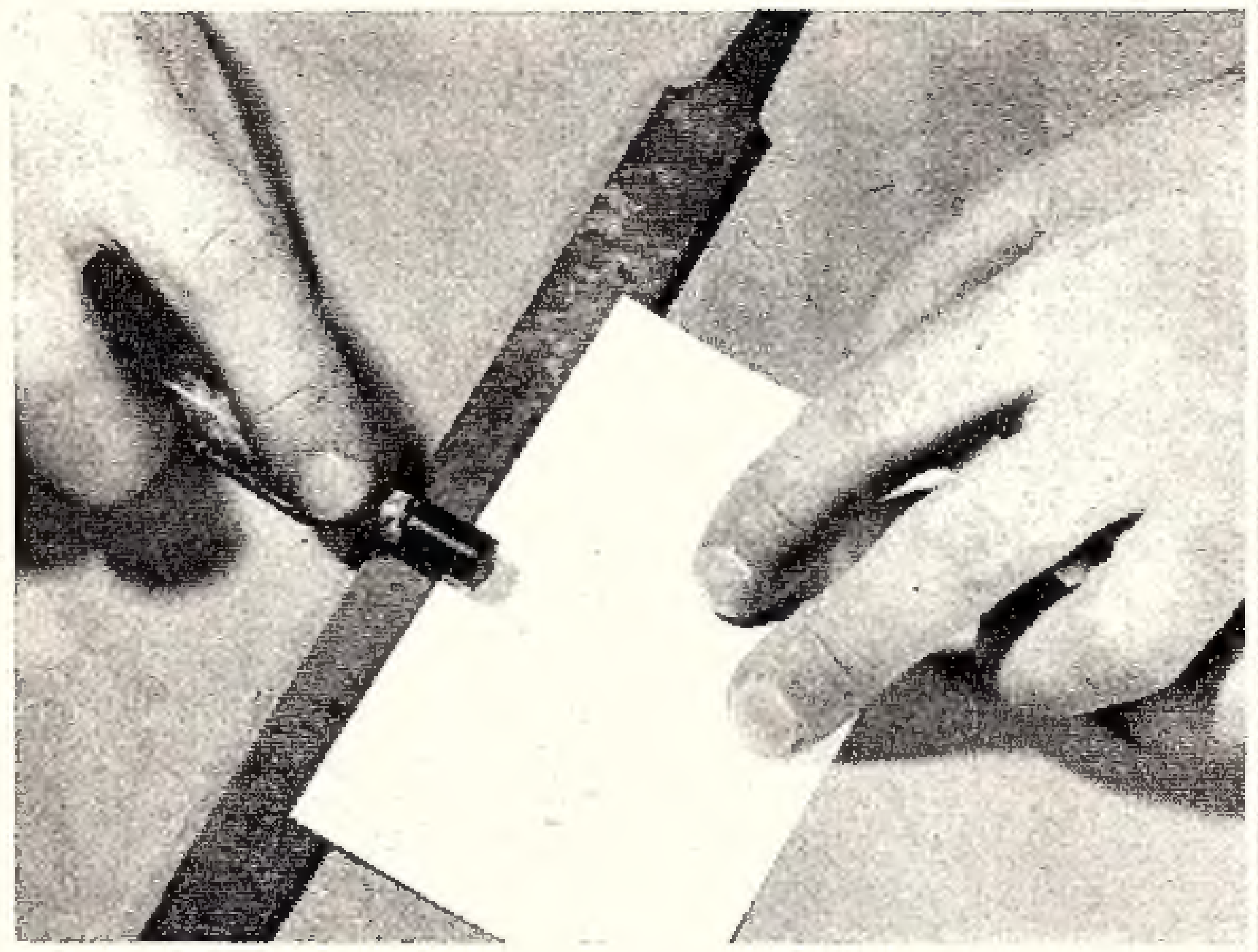
GLASS CUTTER EMBOSSES PRINTS

An ordinary glass cutter supplies a convenient method of embossing the border of prints. Do not apply too much pressure to the cutter.



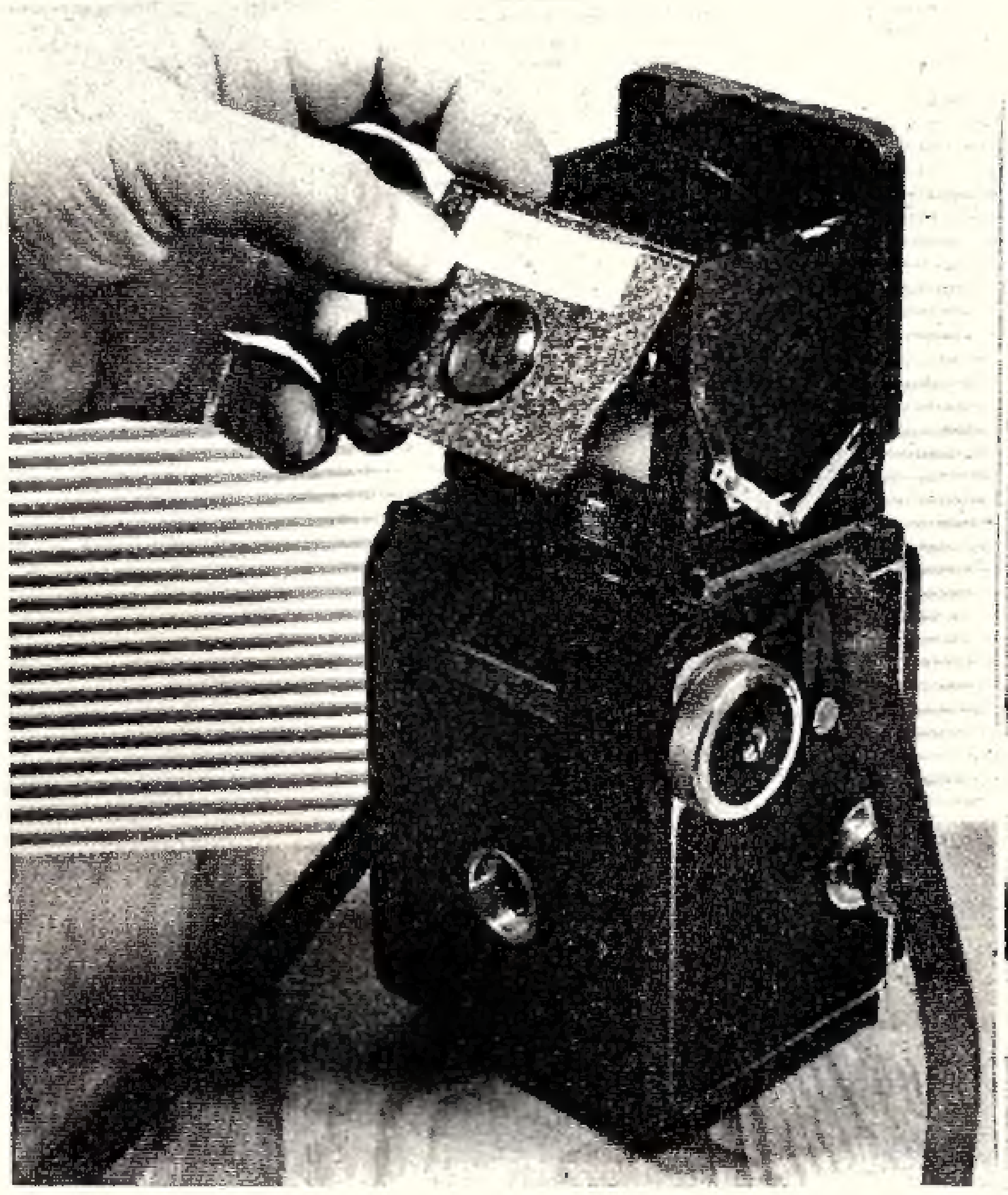
STRAP HOLDS TRIPOD

A book strap fastened to the tripod as shown in the photograph becomes a convenient handle. It then can be carried like a suitcase.



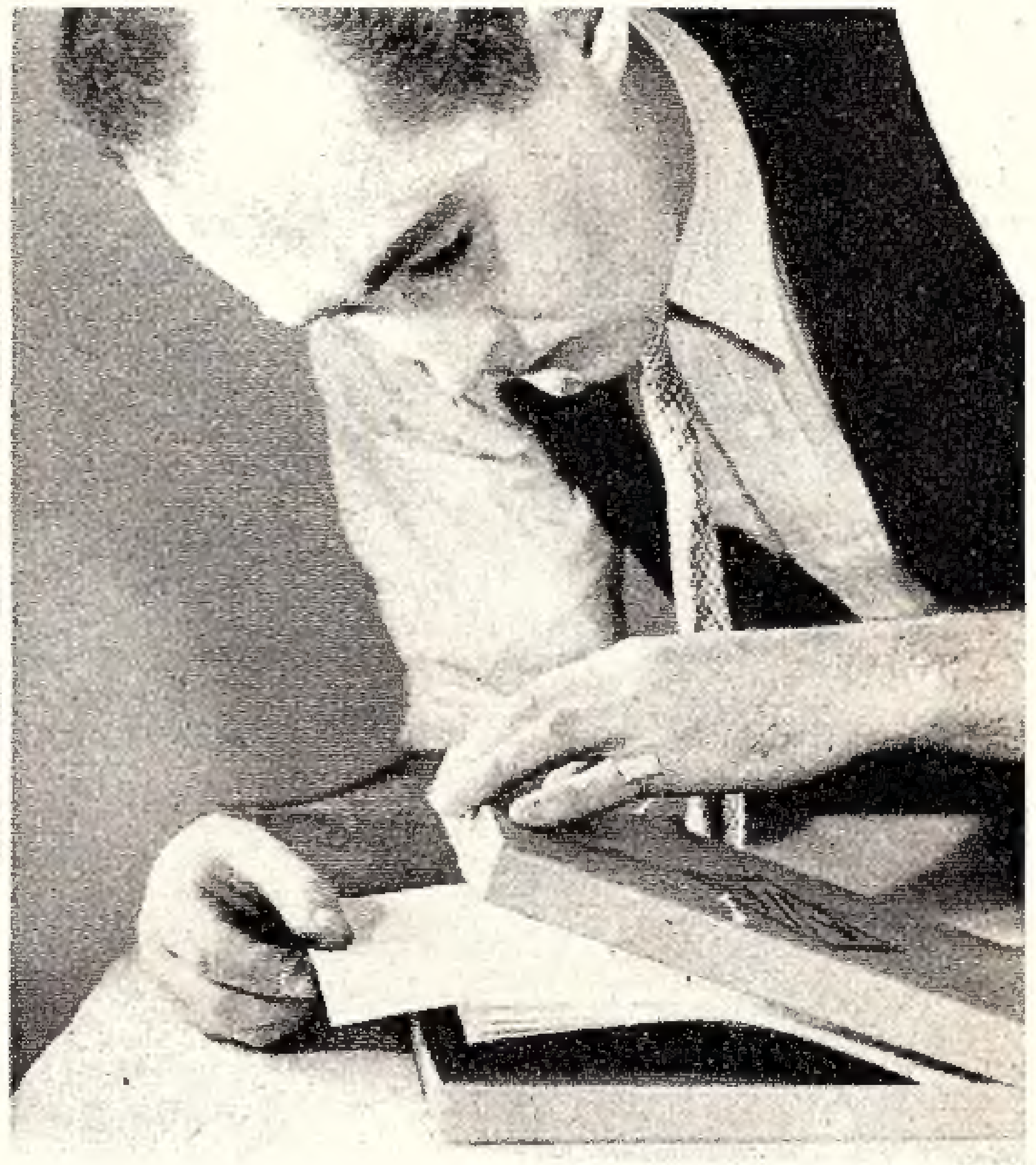
FILE DECORATES BORDER

A raised design on the border of prints can be obtained by placing the edge of the print on a file and rubbing the paper with a hard object.



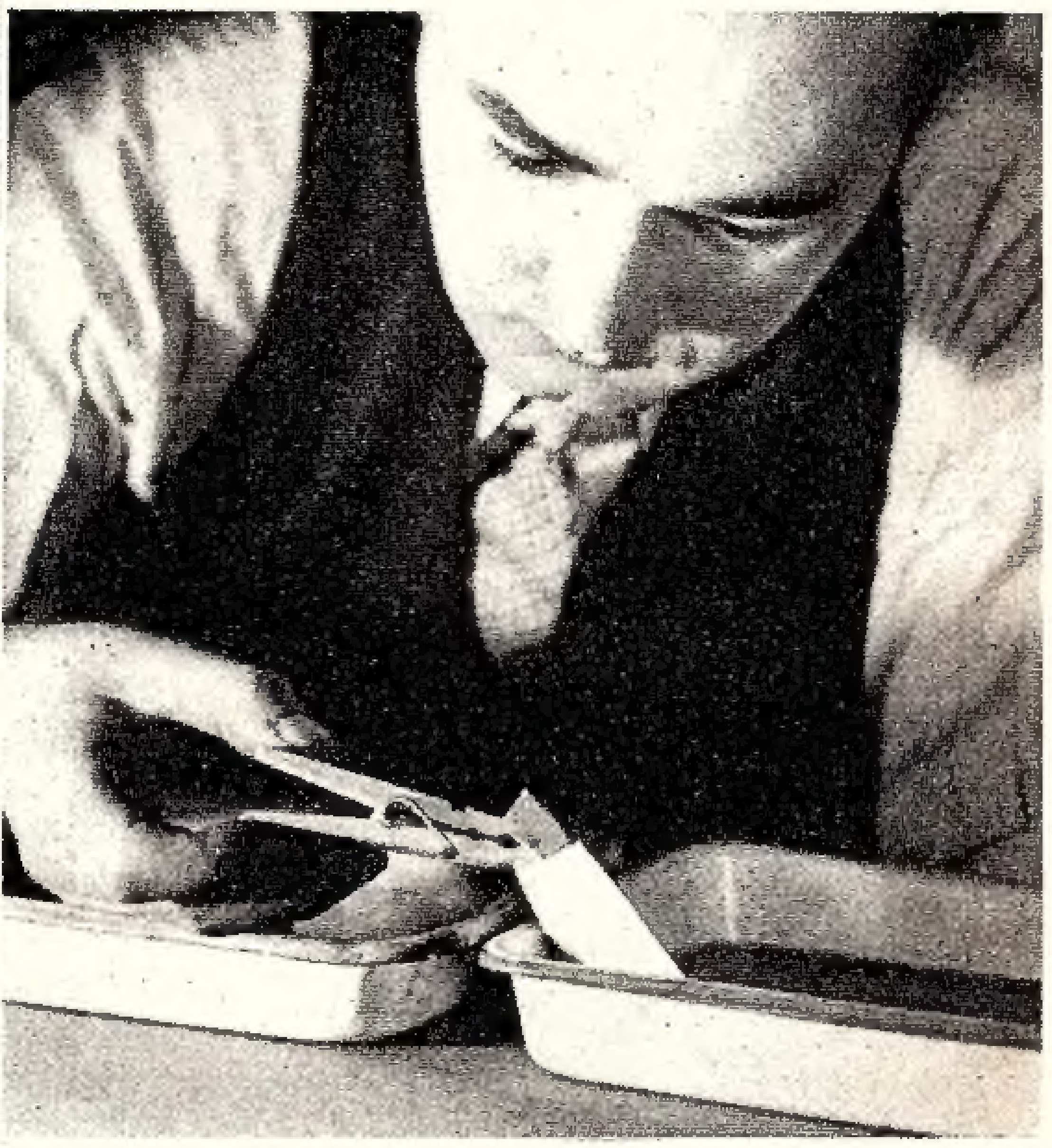
CAMERA IDENTIFICATION

By fastening a piece of adhesive tape on which is printed the name and address of the owner, to the inside of a camera, it can be identified if lost.



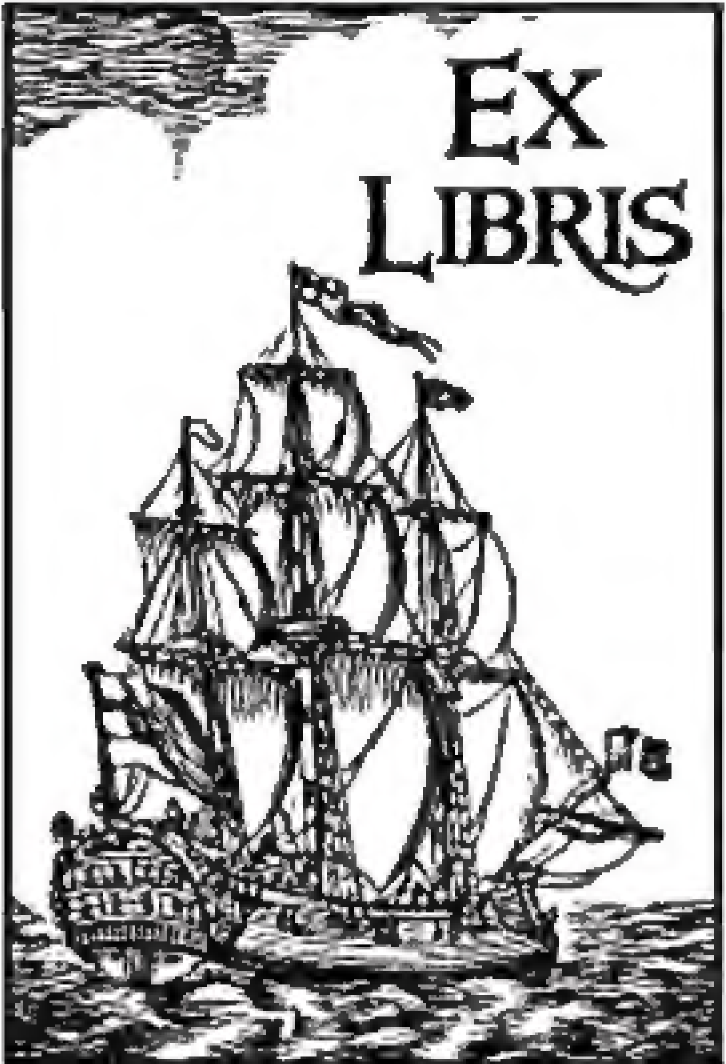
STRING AIDS PAPER REMOVAL

A piece of string fastened to the top of the box containing printing paper, and passed under the pile, simplifies removal of one sheet at a time.



TONGS MADE FROM CLOTHES PINS

By sharpening the points of spring clothes pins, they can be used as print tongs. An ordinary file or sanding wheel quickly shapes the required points.



EX LIBRIS

Anon. Malefactor